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(54) MEDICINE INJECTION SYSTEM, MOBILE TERMINAL, MEDICINE INJECTION APPARATUS, INFORMATION TERMINAL FOR HEALTHCARE PROFESSIONALS, AND METHOD FOR CONTROLLING MEDICINE INJECTION SYSTEM

(57) With the pharmaceutical injection system in an embodiment, pharmaceutical injection amount setting conditions for setting a pharmaceutical injection amount are inputted to a portable terminal (300), and the pharmaceutical injection amount setting conditions are transmitted to a health care worker-use information terminal (500). The portable terminal (300) receives the pharmaceutical injection amount set on the basis of the pharmaceutical injection amount setting conditions transmitted from the health care worker-use information terminal (500), and transmits the pharmaceutical injection amount to a pharmaceutical injection device (100). The health care worker-use information terminal (500) receives the pharmaceutical injection amount setting conditions transmitted from the portable terminal (300), and the pharmaceutical injection amount set on the basis of the pharmaceutical injection amount setting conditions is inputted. The health care worker-use information terminal (500) transmits the inputted pharmaceutical injection amount to the portable terminal (300). The pharmaceutical injection device (100) receives the pharmaceutical injection amount transmitted from the portable terminal (300), and a piston drive mechanism (101) is driven on the basis of the pharmaceutical injection amount.

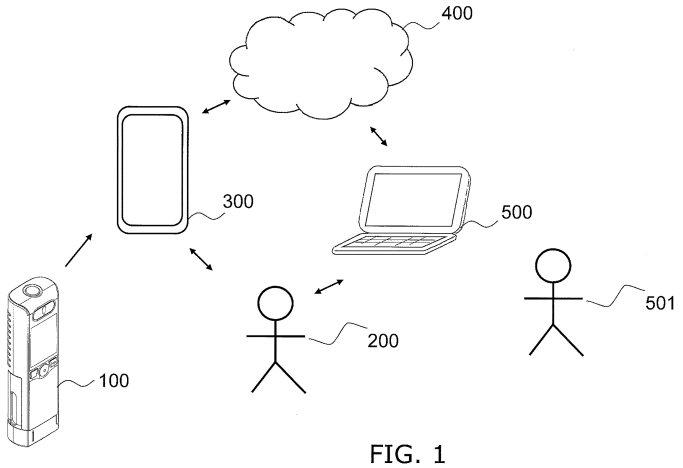

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a pharmaceutical injection system that injects insulin, growth hormone, or another such pharmaceutical, for example, and to a portable terminal, a health care worker-use information terminal, and so forth used in this system.

BACKGROUND ART

[0002] A conventional pharmaceutical injection system of this type is made up of a pharmaceutical injection device and a storage medium that is removably mounted to this pharmaceutical injection device, and is designed so that when the storage medium is mounted to the pharmaceutical injection device, the pharmaceutical injection amount is set automatically (see Patent Literature 1 below, for example).

[0003] With the pharmaceutical injection device in Patent Literature 1, a health care worker takes an individual's condition into account, and stores a pharmaceutical injection amount for each individual in the storage medium, so the pharmaceutical injection amount can be set automatically merely by mounting this storage medium to the pharmaceutical injection device.

CITATION LIST

PATENT LITERATURE

[0004] Patent Literature 1: Japanese Laid-Open Patent Application 2012-34729

SUMMARY

TECHNICAL PROBLEM

[0005] However, in order to change the pharmaceutical injection amount according to how each individual fights a disease, a visit to a medical facility is required every time, which is inconvenient for the user.

[0006] In view of this, it is an object of the present invention to provide a pharmaceutical injection system, a portable terminal, a health care worker-use information terminal, a pharmaceutical injection device, and a method for controlling a pharmaceutical injection system, with which convenience is improved by making it possible to change the pharmaceutical injection amount without having to go to a medical facility.

SOLUTION TO PROBLEM

[0007] To achieve this object, the pharmaceutical injection system of the present invention comprises a pharmaceutical injection device that injects a pharmaceutical, a portable terminal that sets the pharmaceutical injection amount for the pharmaceutical injection device, and a health care worker-use information terminal that is capable of communicating with the portable terminal.

[0008] The portable terminal has a first input component, a first transmitter, a first receiver, and a second transmitter. Pharmaceutical injection amount setting conditions for setting the pharmaceutical injection amount are inputted to the first input component. The first transmitter transmits the inputted pharmaceutical injection amount setting conditions to the health care worker-use information terminal. The first receiver receives a pharmaceutical injection amount set on the basis of the pharmaceutical injection amount setting conditions transmitted from the health care worker-use information terminal. The second transmitter transmits the received pharmaceutical injection amount to the pharmaceutical injection device.

[0009] The health care worker-use information terminal has a second receiver, a second input component, and a third transmitter. The second receiver receives the pharmaceutical injection amount setting conditions transmitted from the portable terminal. A pharmaceutical injection amount set on the basis of the received pharmaceutical injection amount setting conditions is inputted to the second input component. The third transmitter transmits the inputted pharmaceutical injection amount to the portable terminal.

[0010] The pharmaceutical injection device has a cartridge holder, a main body case, a piston, a piston drive mechanism, a third receiver, and a controller. A pharmaceutical cartridge can be mounted in the cartridge holder. The cartridge holder is openably and closeably provided to the main body case. The piston can be inserted into the pharmaceutical cartridge mounted to the cartridge holder inside the main body case. The piston drive mechanism moves the piston so as to insert it into the pharmaceutical cartridge. The third receiver receives the pharmaceutical injection amount transmitted from the portable terminal. The controller drives the piston drive mechanism on the basis of the received pharmaceutical injection amount.

[0011] Accordingly, when the patient inputs pharmaceutical injection amount setting conditions from the first input component of the portable terminal, for example, the pharmaceutical injection amount set by a health care worker is transmitted through the portable terminal to the pharmaceutical injection device, so the pharmaceutical injection amount can be changed without having to go to a medical facility, which is extremely convenient for the user.

ADVANTAGEOUS EFFECTS

[0012] The present invention provides a pharmaceutical injection system, a portable terminal, a health care worker-use information terminal, a pharmaceutical injection device, and a method for controlling a pharmaceutical injection system, which are more convenient because

the pharmaceutical injection amount can be changed without having to go to a medical facility.

BRIEF DESCRIPTION OF DRAWINGS

[0013]

FIG. 1 is an oblique view of the pharmaceutical injection system pertaining to an embodiment of the present invention;
FIG. 2 is an oblique view of the pharmaceutical injection device used in the pharmaceutical injection system shown in FIG. 1;
FIG. 3 is an oblique view of the state when the cartridge holder of the pharmaceutical injection device shown in FIG. 2 has been opened;
FIG. 4 is a front cross section of the internal configuration of the pharmaceutical injection device shown in FIG. 2;
FIG. 5a is a detail view of the Q part in FIG. 4, and FIG. 5b is a detail view of the P part in FIG. 4;
FIG. 6 is a front cross section of the internal configuration of the pharmaceutical injection device shown in FIG. 2;
FIG. 7 is a detail view of the S part in FIG. 6;
FIG. 8 is a front cross section of the internal configuration of the pharmaceutical injection device shown in FIG. 2;
FIG. 9 is a detail view of the U part in FIG. 8;
FIG. 10 is a front cross section of the internal configuration of the pharmaceutical injection device shown in FIG. 2;
FIG. 11 is a detail view of the W part in FIG. 10;
FIG. 12 is a control block diagram of the pharmaceutical injection device shown in FIG. 2;
FIG. 13 is a flowchart of the operation of the pharmaceutical injection device shown in FIG. 2;
FIG. 14 is a control block diagram of the portable terminal used in the pharmaceutical injection system shown in FIG. 1;
FIG. 15 is an oblique view showing a control block diagram of the health care worker-use information terminal used in the pharmaceutical injection system shown in FIG. 1;
FIG. 16A is a flowchart of a method for controlling the portable terminal in the pharmaceutical injection system shown in FIG. 1;
FIG. 16B is a flowchart of a method for controlling the portable terminal in the pharmaceutical injection system shown in FIG. 1;
FIG. 16C is a flowchart of a method for controlling the portable terminal in the pharmaceutical injection system shown in FIG. 1;
FIG. 16D is a flowchart of a method for controlling the portable terminal in the pharmaceutical injection system shown in FIG. 1;
FIG. 17A is a flowchart of the display of the portable terminal in the control method shown in FIG. 16;
FIG. 17B is a flowchart of the display of the portable terminal in the control method shown in FIG. 16;
FIG. 17C is a flowchart of the display of the portable terminal in the control method shown in FIG. 16;
FIG. 18A is a flowchart of the control method in the pharmaceutical injection system shown in FIG. 1;
FIG. 18B is a flowchart of the control method in the pharmaceutical injection system shown in FIG. 1;
FIG. 19 is a diagram of the display of the health care worker-use information terminal and the portable terminal used in the pharmaceutical injection system shown in FIG. 1;
FIG. 20 is a diagram of the display of the health care worker-use information terminal and the portable terminal in the pharmaceutical injection system in a modification example of this embodiment;
FIG. 21 is a diagram of the display of the portable terminal in the pharmaceutical injection system in a modification example of this embodiment;
FIG. 22 is a flowchart of the control method in the pharmaceutical injection system in a modification example of this embodiment;
FIG. 23 is a table of comments by health care workers using the pharmaceutical injection system in a modification example of this embodiment;
FIG. 24 is a table of comments by health care workers using the pharmaceutical injection system in a modification example of this embodiment;
FIG. 25 is a diagram of the configuration of the pharmaceutical injection system in Embodiment 2;
FIG. 26 is a control block diagram of the pharmaceutical injection device in the pharmaceutical injection system in FIG. 25;
FIG. 27 is a flowchart of the control method in the pharmaceutical injection system in FIG. 25;
FIG. 28 is a flowchart of the operation of the communication controller in FIG. 26;
FIG. 29 is a flowchart of the operation of the setting information memory in FIG. 26;
FIG. 30A shows setting information transmitted from the health care worker-use information terminal to the pharmaceutical injection device in the pharmaceutical injection system in FIG. 25;
FIG. 30B shows setting information transmitted from the health care worker-use information terminal to the pharmaceutical injection device in the pharmaceutical injection system in FIG. 25;
FIG. 30C shows setting information transmitted from the health care worker-use information terminal to the pharmaceutical injection device in the pharmaceutical injection system in FIG. 25;
FIG. 31 is a flowchart of the operation of the display operation controller in FIG. 26;
FIG. 32 is a flowchart of the operation of the change reason weighted determination criterion in FIG. 26;
FIG. 33 is a flowchart of the operation of the injection amount computation processor in FIG. 26;
FIG. 34 is a flowchart of the operation of the admin-

istration log memory in FIG. 26; and
FIG. 35 shows the data transmitted by the communication controller to the health care worker-use information terminal in the pharmaceutical injection system in FIG. 25.

DESCRIPTION OF EMBODIMENTS

[0014] An example of when a diabetes patient injects insulin (an example of a pharmaceutical) with the pharmaceutical injection system in an embodiment of the present invention will now be described through reference to the drawings.

Embodiment 1

1. Configuration

Overview of Pharmaceutical Injection System

[0015] FIG. 1 shows the configuration of the pharmaceutical injection system in this embodiment. As shown in FIG. 1, the pharmaceutical injection system in this embodiment comprises a pharmaceutical injection device 100, a portable terminal 300, and a health care worker-use information terminal 500. The pharmaceutical injection device 100 is used to inject a pharmaceutical into a patient 200.

[0016] The portable terminal 300 belongs to the patient 200, and can set the pharmaceutical injection amount for the pharmaceutical injection device 100.

[0017] This portable terminal 300 is configured to allow communication with the health care worker-use information terminal 500 via a network 400. An example of the health care worker-use information terminal 500 is a personal computer belonging to a physician 501. Pharmaceutical Injection Device

[0018] FIG. 2 is an oblique view of the pharmaceutical injection device 100 in this embodiment. FIG. 3 is an oblique view of the state when a cartridge holder of the pharmaceutical injection device 100 in this embodiment has been opened. FIG. 4 is a front cross section of the internal configuration of the pharmaceutical injection device 100 in this embodiment.

[0019] As shown in FIGS. 2 and 3, the pharmaceutical injection device 100 in this embodiment comprises a cylindrical main body case 1 that can be held in one hand. A power switch 2 is provided to the upper face of this main body case 1, and an injection needle mounting component 3 is provided to the lower face as shown in FIG. 4. In the description in this Specification, the side on which the power switch 2 is provided shall be the top or the rear, and the side on which the injection needle mounting component 3 is provided (the opposite side) shall be the bottom or the front.

[0020] A pharmaceutical injection switch 4, a display component 5, and setting switches 6 for setting the pharmaceutical injection amount are provided in that order, from top to bottom, on the front portion of this main body case 1.

[0021] As shown in FIGS. 2 and 3, a cylindrical cartridge holder 7 is also provided openably and closeably to the main body case 1.

[0022] That is, the cartridge holder 7 is first opened as indicated by the arrow A in FIG. 3, and then a pharmaceutical cartridge 9 is inserted through an insertion opening 8 provided to the upper face of the cartridge holder 7 as shown by the arrow B, after which the cartridge holder 7 is closed as shown in FIG. 2, whereupon the pharmaceutical cartridge 9 is mounted inside the main body case 1 as shown in FIG. 4.

[0023] FIG. 5a shows the configuration near the insertion opening 8 of the cartridge holder 7, and is a detail view of the Q part in FIG. 4. FIG. 5b shows the configuration near a home point sensor 23, and is a detail view of the P art in FIG. 4. FIGS. 4, 5a, and 5b show the state when a piston 10 is disposed at its home position (discussed below).

[0024] As shown in FIGS. 4, 5a, and 5b, the piston 10 is provided above the insertion opening 8 of the cartridge holder 7 inside the main body case 1, and this piston 10 is designed to be inserted into or pulled out of the pharmaceutical cartridge 9 through the insertion opening 8 of the cartridge holder 7 by a piston drive mechanism 101 having a screw 11, gear 12 and a motor 13. In FIG. 4, the arrow C indicates the direction in which the piston 10 is inserted into the pharmaceutical cartridge 9 mounted to the cartridge holder 7 (also referred to as downward or the forward direction), and the arrow D indicates the direction in which the piston 10 is pulled out of the pharmaceutical cartridge 9 mounted to the cartridge holder 7 (also referred to as upward or the retraction direction).

Configuration of Cartridge Holder 7 and Nearby

[0025] The cartridge holder 7 will now be described in detail through reference to FIGS. 2 to 5.

[0026] As discussed above, the cartridge holder 7 is in the form of a cylinder having the insertion opening 8 in its upper face. An opening 14 is also provided to the lower face. The outer peripheral part of this opening 14 is threaded and serves as the injection needle mounting component 3 (see FIG. 4).

[0027] Also, an injection needle detector switch 15 is provided to this injection needle mounting component 3, and whether or not an injection needle 16 has been mounted to the injection needle mounting component 3 is detected by this injection needle detector switch 15 as in FIG. 6 (discussed below).

[0028] Furthermore, a shaft support 17 that supports the cartridge holder 7 so that it can open and close with respect to the main body case 1 is provided to the outer peripheral face at the bottom part of this cartridge holder 7.

[0029] Also, one end of an eject spring 18, which is used as an example of a biasing member, is linked on

the opposite side (inside) of the shaft support 17 in the opening direction of the cartridge holder 7.

[0030] The other end of the eject spring 18 is linked to the main body case 1 at the top.

[0031] That is, as shown in FIG. 4, a holder-side linking component 71 that links to a first end 18a of the eject spring 18 is formed on the inside portion of the end of the cartridge holder 7 on the opening 14 side. Also, the eject spring 18 is disposed along the cartridge holder 7 on the inside of the cartridge holder 7 in a state in which the cartridge holder 7 is closed. A second end 18b of the eject spring 18 is linked to a main body-side linking component 111 formed on the main body case 1 on the insertion opening 8 side.

[0032] That is, when a force is exerted in the direction in which the eject spring 18 compresses, the insertion opening 8 portion at the top of the cartridge holder 7 is biased in the direction of opening with respect to the main body case 1.

[0033] Also, a latched component 19 is provided as shown in FIG. 5a to the upper part of the cartridge holder 7 in order to keep the cartridge holder 7 in its closed position as shown in FIGS. 2 and 4 against the biasing in the opening direction provided by the eject spring 18.

[0034] Furthermore, an ejector tab 20 that latches the latched component 19 is provided above the latched component 19 inside the main body case 1. This ejector tab 20 is adjacent and linked to a protrusion 22a on the lower end side of a slender lever 22. A spring 21 hits the opposite side of the protrusion 22a from the ejector tab 20, and the protrusion 22a and the ejector tab 20 are biased in the direction of the latched component 19 below (the insertion direction C) (see FIG. 5).

[0035] Also, the ejector tab 20 has on its inside a contact face 20a formed parallel to the movement direction of the piston 10, and the latched component 19 has on its outside a contact face 19a formed parallel to the movement direction of the piston 10 in a state in which the cartridge holder 7 is closed. When the contact face 20a and the contact face 19a come into contact, they maintain the cartridge holder 7 in its closed state.

[0036] Also, the ejector tab 20 has a sloped part 20b that slopes outward from the lower end of the contact face 20a. The latched component 19 has a sloped part 19b that slopes inward from the upper end of the contact face 19a. When the cartridge holder 7 is closed, the sloped part 20b slides with respect to the sloped part 19b, which affords smooth closure.

[0037] Also, as shown in FIGS. 4 and 5b, the lever 22 to which the ejector tab 20 is linked has a protrusion 22b disposed diagonally across from the protrusion 22a at the upper end of the lever 22 (a location where the protrusion direction is reversed), and is provided on a feed screw 11 side of the piston 10.

[0038] Specifically, as shown in FIG. 4, the slender lever 22 is disposed along the movement direction of the piston 10, to the inside of the piston 10 when the piston 10has not been inserted into the pharmaceutical cartridge 9. The protrusion 22a and the ejector tab 20 are provided on the cartridge holder 7 side of the lever 22, and the protrusion 22b is provided on a gear 12 side of the lever 22. Thus, the lever 22 links the protrusion 22b and the ejector tab 20, and the lever 22, the protrusion 22b, and the ejector tab 20 are biased downward by the spring 21 so as to latch the latched component 19.

Configuration of Home Point Sensor 23 and Nearby

[0039] As shown in FIG. 5b, the home point sensor 23, which senses the home position of the piston 10, is provided on the rear end side of the piston 10 (the upper end side in FIG. 2). The home point sensor 23 is fixed on the inside of the main body case 1. A transmitting type of photoelectric sensor can be used as the home point sensor 23, for example, and the home position of the piston 10 can be sensed when a protrusion 10a provided to the piston 10 blocks out the light.

[0040] A protrusion 10b that protrudes to the lever 22 side is provided to the piston 10. The protrusion 10b provided on the rear end part of the piston 10 is lower than the protrusion 22b of the lever 22 (on the insertion direction C side), hits the protrusion 22b only when the piston 10 retracts above the home position (when it moves in the pull-out direction D), and moves the entire lever 22 backward (upward in FIGS. 2 and 3) along with it.

[0041] Meanwhile, during pharmaceutical injection (the state in FIGS. 6 and 7), when the piston 10 moves downward (that is, moves below the home position), the protrusion 22b on the upper end side of the lever 22 moves downward along with the protrusion 10b provided to the rear end part of the piston 10, but the lever 22 stops at the position indicated in FIGS. 6 and 7 (lower end position), and does not descend beyond that.

[0042] Therefore, the protrusion 22b on the upper end side of the lever 22 moves away from the protrusion 10a of the piston 10. This structure that prevents further descent can be, for example, a configuration in which the lever 22, the protrusion 22b, and the ejector tab 20 hit a protrusion (not shown) and stop upon reaching the position shown in FIG. 4. The position beyond which the ejector tab 20 does not descend is indicated by the dotted line in FIG. 9 (discussed below).

[0043] Thus, the latched component 19 provided inside the main body case 1 engages with the ejector tab 20 adjacent to the protrusion 22a on the lower end side of the lever 22, which maintains the cartridge holder 7 in its closed state.

[0044] Specifically, the ejector tab 20 attached to the protrusion 22a on the lower end side of the lever 22 returns to its home position after the piston 10 has completed injecting all of the pharmaceutical in the pharmaceutical cartridge, and if the piston 10 moves further upward after this, only then is the latched component 19 inside the main body case 1 disengaged, putting the cartridge holder 7 in an open state.

[0045] In the above example, the ejector tab 20 and

the lever 22 are separate components that are linked, but this is not the only option, and they may instead be formed integrally. Operation During Pharmaceutical Administration

[0046] FIG. 6 shows the state during pharmaceutical administration with the pharmaceutical injection device in this embodiment. FIG. 7 is a detail view of the S part in FIG. 6.

[0047] The above-mentioned FIGS. 4 and 5 showed the initial state of the pharmaceutical injection device (the state when the piston 10 is in its home position), but FIGS. 6 and 7 show the operation of injecting the pharmaceutical (at the start of the injection operation).

[0048] Specifically, the injection of the pharmaceutical inside the pharmaceutical cartridge 9 is commenced by pressing the pharmaceutical injection switch 4 (see FIG. 3) provided to the outer peripheral surface of the main body case 1.

[0049] More specifically, the motor 13 of the piston drive mechanism 101 is actuated, the gear 12 linked to the motor 13 rotates, and this rotation of the gear 12 turns the feed screw 11, converting to the linear motion of the piston 10.

[0050] When the piston 10 moves downward, the distal end of the piston 10 hits a gasket (not shown) at the rear end of the pharmaceutical cartridge (see FIG. 7), and when the piston 10 is then moved after this, the pharmaceutical inside the pharmaceutical cartridge 9 goes through the injection needle 16 mounted to the tip of the pharmaceutical cartridge 9 and is injected under the skin.

Operation During Ejection of Cartridge Holder 7

[0051] The operation during ejection of the cartridge holder 7 will now be described through reference to FIGS. 8 and 9. FIG. 8 shows the state during the ejection of the cartridge holder 7 of the pharmaceutical injection device in this embodiment. FIG. 9 is a detail view of the U part in FIG. 8.

[0052] When the pharmaceutical injection operation described through FIGS. 6 and 7 above is completed and there is no more pharmaceutical in the pharmaceutical cartridge 9, the cartridge holder 7 has to be opened up to replace the pharmaceutical cartridge 9.

[0053] More specifically, in FIG. 6, when the piston 10 moves the gasket of the pharmaceutical cartridge 9 to the distal end, and all of the pharmaceutical in the pharmaceutical cartridge 9 has been injected, the piston 10 is retracted to its home position by the piston drive mechanism 101.

[0054] After this, the pharmaceutical cartridge 9 needs to be replaced, so the piston 10 is moved above its home position as shown in FIGS. 8 and 9 (see FIG. 5b).

[0055] At this point, the protrusion 10b at the upper end part of the piston 10 and the protrusion 22b of the lever 22 come into contact, so the lever 22 moves upward at the same time.

[0056] Also, the ejector tab 20 attached to the lower end of the lever 22 is moved upward at the same time while compressing the spring 21 that is biasing it, and this operation disengages the ejector tab 20 from the latched component 19.

[0057] At this point, the cartridge holder 7 is opened outward from the main body case 1 by the biasing force of the eject spring 18, with the shaft support 17 serving as a fulcrum.

[0058] Here, whether or not the cartridge holder 7 has been opened can be detected by an opening and closing detector switch 24 provided near the ejector tab 20 (see FIG. 5a, etc.).

[0059] Before this eject operation is performed, the injection needle 16 mounted to the injection needle mounting component 3 needs to be removed for the sake of safety, so a display prompting the removal of the injection needle 16 is given on the display component 5 provided to the front face of the main body case 1.

[0060] Also, the removal of the injection needle 16 can be detected by the injection needle detector switch 15.

Operation When Cartridge Holder 7 is Closed

[0061] FIG. 10 is a cross section of the pharmaceutical injection device when the cartridge holder 7 is closed. FIG. 11 is a detail view of the W part in FIG. 10.

[0062] FIGS. 10 and 11 show the state when the piston 10 has been moved to its home position after the ejection operation described through FIGS. 8 and 9 above.

[0063] At this point, as the piston 10 goes back to its home position, the lever 22 and the ejector tab 20 also descend, returning to the initial state (see FIG. 4) at the home position of the piston 10.

[0064] However, since the cartridge holder 7 at this point is still open, the latched component 19 and the ejector tab 20 are not engaged.

[0065] After this, the pharmaceutical cartridge 9 is replaced, and when the cartridge holder 7 is moved so that it closes to the main body case 1 side, the sloped part 19b of the latched component 19 rides up over the sloped part 20b of the ejector tab 20 as shown in FIG. 10, finally the latched component 19 and the ejector tab 20 engage, and this state is maintained.

[0066] In other words, that cartridge holder 7 that has returned to its initial state and that houses the replaced pharmaceutical cartridge 9 is held within the main body case 1. Control Configuration

[0067] FIG. 12 is a block diagram of the electrical circuit in the main body case 1 of the pharmaceutical injection device 100, and the surrounding area. A controller 25 has a CPU 250, is connected to various I/O interfaces and drive systems, and performs control over these.

[0068] More specifically, in terms of interface components, the CPU 250 of the controller 25 is connected to the power switch 2, the pharmaceutical injection switch 4, the setting switches 6, etc., and checks the input of the various control switches.

[0069] In terms of state detection, the CPU 250 of the

controller 25 is also connected to the injection needle detector switch 15, which detects the mounting state of the injection needle 16, the opening and closing detector switch 24, which detects whether the cartridge holder 7 is open or closed, and so forth.

[0070] In terms of the drive system for the piston 10, the motor 13 that drives the piston 10 is connected to the CPU 250 inside the controller 25 via a dedicated motor control circuit 27 that controls this motor. Also, an encoder 28 that detects position information about the piston 10 is connected to the motor 13, and outputs pulses to the CPU 250 according to the rotation of the motor 13. The CPU 250 counts the pulses outputted by the encoder 28, and thereby calculates the amount of movement of the piston 10. Furthermore, the home point sensor 23, which senses the home position of the piston 10, is connected to the CPU 250, and the CPU 250 recognizes the current piston position by using the output of the encoder 28 and the output of the home point sensor 23. A memory 32 is connected to the CPU 250, and the recognized current piston position is stored as piston position information. This piston position information is a positive or negative numerical value, and when the piston position information is zero, it means that the piston is in its home position. When the piston position information is positive, it means that the piston is below the home position. Conversely, when the piston position information is negative, it means that the piston is above the home position. The absolute value of the piston position information indicates the distance the piston has moved from its home position.

[0071] More specifically, when the trailing edge of the protrusion 10a provided to the piston 10 crosses the home point sensor 23, it is concluded that the piston is in its home position, and the CPU 250 resets the piston position information stored in the memory 32 to zero. The CPU 250 then updates the value by adding or subtracting one to the piston position information according to the drive direction of the motor 13 every time the encoder 28 connected to the motor 13 outputs one pulse. In this way, the CPU 250 can always recognize the current piston position by using the piston position information stored in the memory 32. The memory 32 here is constituted by an EEPROM or another such nonvolatile memory, and the piston position information stored in the memory 32 is preserved when the power to the device is shut off. This piston position information is always reset to zero when the trailing edge of the protrusion 10a provided to the piston 10 crosses the home point sensor 23. That is, the home point sensor 23 is used to correct the piston position. The CPU 250 monitors the output of the home point sensor 23, and since it is possible that some kind of malfunction has occurred in the operation of the device when the error with respect to zero in the piston position information stored in the memory 32 upon detecting that the home point sensor 23 is in its home position has exceeded a specific threshold, processing is performed to display a warning on the display component 5 and halt operation, etc.

[0072] In addition, a buzzer 30 that alerts the user when an error occurs is connected to the CPU 250 via a buzzer control circuit 29 that controls the buzzer 30, inside the controller 25. The display component 5, which displays various messages, numerical values, and so forth, is connected to the CPU 250 via a dedicated display circuit 31 that controls the display component 5, inside the controller 25. The display component 5 is constituted by an LCD panel or the like. Furthermore, the memory 32, which stores dosages, administration data, and so forth, and a timer 33, which measures the elapsed time, are installed in the controller 25 and connected to the CPU 250. A battery 26, which is the power supply for the device, is also installed and connected to the controller 25. Also, the pharmaceutical injection device 100 in this embodiment is provided with a near field communication component 25a that can communicate with the portable terminal 300, and the near field communication component 25a is connected to the controller 25. This near field communication component 25a will be discussed in detail below.

Operation of Ejector Mechanism of Pharmaceutical Injection Device

[0073] The operation of the ejector mechanism will now be described through reference to the flowchart in FIG. 13.

[0074] FIG. 13 assumes a timing at which it has become necessary to eject (open up) the cartridge holder 7, but examples of the timing of this ejection include when all of the pharmaceutical in the above-mentioned pharmaceutical cartridge 9 has been completely injected, and when it becomes necessary to replace an expired pharmaceutical.

[0075] The latter case, when it is necessary to replace an expired pharmaceutical, is, for example, a case in which a specific length of time (five weeks in this case) has elapsed since a pharmaceutical cartridge 9 whose expiration date is determined to be five weeks from the start of use was installed in the pharmaceutical injection device.

[0076] In this case, if the timer 33 is started at the point when the pharmaceutical cartridge 9 is replaced, and the time on the timer 33 has gone past the specified time, a period overrun error is determined, and control is performed to replace the pharmaceutical cartridge 9.

[0077] The point when the timer 33 is started here may, for example, be at the point when the pharmaceutical cartridge 9 has been replaced and the opening and closing detector switch 24 has detected that the cartridge holder 7 is closed, or at the point when the pharmaceutical in the pharmaceutical cartridge 9 is administered for the first time (the start of pharmaceutical administration).

[0078] The condition for needing to replace the pharmaceutical cartridge 9 can be when the pharmaceutical in the pharmaceutical cartridge 9 runs out, when the pharmaceutical has expired, etc.

[0079] As shown in FIG. 13, if it is necessary to replace the pharmaceutical cartridge 9, the controller 25 uses the opening and closing detector switch 24 to detect whether or not the cartridge holder 7 is closed (S1 in FIG. 13).

[0080] At this point, if the cartridge holder 7 is open, a display prompting the user to replace the pharmaceutical cartridge 9 and close the cartridge holder 7 is displayed on the LCD panel that is the display component 5 (S12 in FIG. 13).

[0081] On the other hand, if the cartridge holder 7 is closed, the controller 25 uses the home point sensor 23 to confirm whether or not the piston 10 has returned to near its home position (S2 in FIG. 13).

[0082] At this point the home point sensor 23 determines that the piston 10 is near its home position if the protrusion 10a is within the detection range of the home point sensor 23. The detection range here encompasses not only when the trailing edge of the protrusion 10a has crossed the home point sensor 23, but also when the protrusion 10a has crossed the home point sensor 23 from above, that is, when the leading edge of the protrusion 10a has crossed the home point sensor 23.

[0083] If the piston 10 has not returned to its home position, the controller 25 actuates the motor control circuit 27, rotates the motor 13, and moves the piston 10 in the retraction direction (the pull-out direction D) (S3 in FIG. 13).

[0084] When the rotation of the motor 13 in S3 has caused the trailing edge of the protrusion 10a to cross the home point sensor 23, the piston 10 is assumed to have returned to its home position, and there is a transition from S2 to S4. The motor 13 is stopped at this point.

[0085] If the home point sensor 23 in S2 has confirmed that the piston 10 is near its home position, or in S3 that the piston 10 has returned to its home position, the controller 25 uses the injection needle detector switch 15 to confirm whether or not the injection needle 16 is mounted (S4 in FIG. 13).

[0086] If the injection needle 16 is still mounted, the controller 25 causes the display component 5 to display a message prompting the user to remove the injection needle 16 (S5 in FIG. 13).

[0087] If the injection needle 16 has been removed, the controller 25 causes the display component 5 to display a message prompting the user to open the cartridge holder 7 (S6 in FIG. 13).

[0088] Next, the operation of actually opening up the cartridge holder 7 is performed (S7 in FIG. 13).

[0089] More specifically, the controller 25 commands the motor control circuit 27 to rotate the motor 13 and move the piston 10 further in the retraction direction (the pull-out direction D) from the home position.

[0090] Consequently, as shown in FIG. 5b, the protrusion 10b of the piston 10 comes into contact with the protrusion 22b of the lever 22, and the entire slender lever 22 moves upward. Along with this, the ejector tab 20 that is adjacent and attached to the lower side of the lever 22 also retracts upward, moving away from the latched component 19 provided to the main body case 1, and disengaging.

[0091] When the latched component 19 is disengaged from the ejector tab 20, as shown in FIGS. 8 and 9, the biasing force of the eject spring 18 causes the cartridge holder 7 to open outward, with the shaft support 17 serving as the fulcrum.

[0092] The controller 25 uses the opening and closing detector switch 24 to confirm whether or not the cartridge holder 7 has been opened (S8 in FIG. 13).

[0093] If the cartridge holder 7 has not been opened, the flow returns to S7 in FIG. 13, and the retraction of the piston 10 is continued.

[0094] Next, if the cartridge holder 7 is open, the controller 25 again advances the piston 10 in the insertion direction C via the motor control circuit 27, the motor 13, the gear 12, the feed screw 11, etc., moving it to the home position (S9 in FIG. 13).

[0095] The controller 25 then uses the home point sensor 23 to detect or confirm whether or not the piston 10 has returned to its home position (S10 in FIG. 13), and if it has not returned to the home position, the control goes back to S9 in FIG. 13, and the advance of the piston 10 is continued.

[0096] If the piston 10 has returned to its home position, the controller 25 causes the motor control circuit 27 to stop the motor 13, thus stopping the piston 10 (S11 in FIG. 13).

[0097] Next, the controller 25 causes the display component 5 to display a message prompting the user to replace the pharmaceutical cartridge 9 and to close the cartridge holder 7 after this replacement (S12 in FIG. 13).

[0098] The pharmaceutical cartridge 9 is then replaced, and the opening and closing detector switch 24 then detects whether or not the cartridge holder 7 has been closed (S13 in FIG. 13).

[0099] If the cartridge holder 7 is still open, the control goes back to S12, and the controller 25 waits for it to be closed.

[0100] If it is confirmed that the cartridge holder 7 is closed, the procedure is ended. At this point the timer 33 (see FIG. 12) may be started.

Communication Component of Pharmaceutical Injection Amount

[0101] A feature of this embodiment is that with the pharmaceutical injection device 100, the pharmaceutical injection amount for a patient 200 can be set with the portable terminal 300 belonging to the patient 200.

[0102] More specifically, when the patient 200 or someone else uses the portable terminal 300 to input pharmaceutical injection amount change conditions, these pharmaceutical injection amount change conditions are transmitted over the network 400 to the health care worker-use information terminal 500, and when the health care worker changes the pharmaceutical injection amount, the injection amount change setting is transmit-

ted through the portable terminal 300 to the pharmaceutical injection device 100.

[0103] To this end, with the pharmaceutical injection device 100, in addition to the above configuration, the near field communication component 25a is connected to the controller 25 as shown in FIG. 12.

[0104] This near field communication component 25a is provided inside the main body case 1.

Portable Terminal

[0105] FIG. 14 is a block diagram of the control configuration of the portable terminal 300 in this embodiment.

[0106] The portable terminal 300 shown in FIG. 1 is what is commonly called a cell phone, and has a near field communication component 34, a controller 35, a communication component 36, a memory 37, a display component 38, and an input component 39. The near field communication component 34 is able to communicate with the near field communication component 25a of the pharmaceutical injection device 100. The controller 35 is connected to the near field communication component 34. The communication component 36, the memory 37, the display component 38, and the input component 39 are connected to the controller 35. The input component 39 is constituted by a touch screen or the like.

[0107] Of these, because the near field communication component 34 makes use of NFC, the portable terminal 300 and the pharmaceutical injection device 100 can perform near field communication between the near field communication component 25a and the near field communication component 34.

[0108] This portable terminal 300 is also able to communicate with the health care worker-use information terminal 500 via the communication component 36 and the network 400.

[0109] This portable terminal 300 is also provided with a power switch 40, an acceleration sensor 41, a brightness sensor 42, a microphone 43, a buttery 44, a sounder 45, and a GPS 46. These are connected to the controller 35.

Health Care Worker-use Information Terminal

[0110] FIG. 15 is a block diagram of the control configuration of the health care worker-use information terminal 500 in this embodiment.

[0111] As shown in FIG. 15, the health care worker-use information terminal 500, which can be connected to the portable terminal 300 over the network 400, has a communication component 47, a controller 48, a memory 49, a display component 50, and an input component 51. The communication component 47 is able to communicate with the communication component 36 of the portable terminal 300 over the network 400. The controller 48 is connected to the communication component 47. The memory 49, the display component 50, and the input component 51 are connected to the controller 48.

[0112] The health care worker-use information terminal 500 is also connected to a near field communication component 52 that can perform near field communication with the near field communication component 34 of the portable terminal 300, and an external storage device 53. The health care worker-use information terminal 500 is further provided with a battery 44, the power switch 40, etc.

[0113] The near field communication component 52 makes use of near field wireless communication (NFC)

2. Operation

[0114] Next, the operation of the pharmaceutical injection system in this embodiment will be described, and an example of how the pharmaceutical injection system of the present invention is controlled will also be discussed.

2-1 Input of Injection Amount Change Conditions

[0115] FIGS. 16A to 16C are flowcharts of the operation involved in changing the pharmaceutical injection amount at the portable terminal 300. FIGS. 17A and 17B illustrate the operation involved in changing the pharmaceutical injection amount, and focus on the display component 38. The states of the display component 38 in FIGS. 17A and 17B are when the patient 200 inputs change conditions for changing the pharmaceutical injection amount. Also, the states of the display component 38 in FIGS. 17A and 17B are given the numbers from the steps S in FIGS. 16A to 16D, and show the states of the display component 38 in these steps S.

[0116] Specifically, when a pharmaceutical injection amount change program stored in the memory 37 is launched in a state in which the power switch 40 of the portable terminal 300 has been turned on, a pharmaceutical injection amount change conditions input screen is displayed on the display component 38 (S101 in FIG. 16A, and S101 in FIG. 17).

[0117] In view of this, in S102, when the user touches an inject key 601 appearing on the display component 38 (S101 in FIG. 16A), a reference injection amount set by a health care worker is initially displayed on the display component 38 (S103 in FIG. 16A, and S103 in FIG. 17).

[0118] Since an inject key 602 is also displayed on the display component 38 on the screen where the reference injection amount is displayed (S103 in FIG. 17), when this inject key 602 is touched, the health care worker confirms the pharmaceutical injection amount, after which the pharmaceutical injection device 100 is used to inject the pharmaceutical. This operation will be described below.

[0119] Meanwhile, in S103 in FIG. 17A, when an adjust key 603 for adjusting the dose displayed on the display component 38 is touched, an adjustment mode selection key is displayed on the display component 38 (S104 and S105 in FIG. 16A, and S105 in FIG. 17A). That is, if the pharmaceutical injection amount does not need to be ad-

justed, the above-mentioned inject key 602 is selected, but if adjustment is needed, the adjust key 603 is selected.

[0120] When a simple adjustment key 604 is touched, an increase key 605 and a decrease key 606 are displayed on the display component 38 (S106 and S107 in FIG. 16A, and S107 in FIG. 17A). Specifically, the increase key 605 is selected when the user wants to increase the pharmaceutical injection amount, and the decrease key 606 is selected when the user wants to decrease the pharmaceutical injection amount. The two states shown in S107 in FIG. 17A are when each of these keys has been selected, with the selected key being highlighted.

[0121] In S107 in FIG. 17A, when either the increase key 605 or the decrease key 606 is operated (S108 in FIG. 16A), a screen for inputting the reason that key was selected is then displayed on the display component 38 (S109 in FIG. 16A and S109 in FIG. 17A). Information related to the adjustment amount, regarding whether the increase key 605 or the decrease key 606 was operated, is transmitted to the health care worker-use information terminal 500 along with the change reason (discussed below) in S115 (discussed below). The reasons for changing the pharmaceutical injection amount are preset by a health care worker, and in this embodiment blood glucose level, meal size, amount of activity (also called amount of exercise), and scheduled administration date and time are set.

[0122] In this embodiment, first of all, a high key 607, a normal key 608, and a low key 609 are displayed on the display component 38 to select whether the blood glucose level measured the last time was high, normal, or low (S109 in FIG. 16A and S109 in FIG. 17A). An example of "high" here is when the average blood glucose level over the past two to three days is above 200 mg/dL, and is above 160 mg/dL before breakfast. An example of "normal" is when the average blood glucose level over the past two to three days is 80 to 200 mg/dL, and is 60 to 160 mg/dL before breakfast. An example of "low" is when the average blood glucose level over the past two to three days is below 80 mg/dL, and is below 60 mg/dL before breakfast. The level cutoffs are set so that they can be checked in "Help."

[0123] Next, a large key 610, a normal key 611, and a small key 612 are displayed on the display component 38 to select whether the meal size was large, normal, or small (S110 in FIG. 16A and S110 in FIG. 17A). Examples of the reason for this change include a patient whose intake energy is suppressed by dietetic therapy. An example of "large" is when the intake energy is above 1200 kcal/day and the carbohydrate count is above 500 g/day. An example of "normal" is when the intake energy is 600 to 1200 kcal/day and the carbohydrate count is 200 to 500 g/day. An example of "small" is when the intake energy is below 600 kcal/day and the carbohydrate count is below 200 g/day. The level cutoffs are set so that they can be checked in "Help."

[0124] Next, a low key 613, a normal key 614, and a high key 615 are displayed on the display component 38 to select whether the amount of activity was low, normal, or high (S111 in FIG. 16A and S111 in FIG. 17A). Examples of the reason for this change include a patient whose energy consumption in walking is guided by exercise therapy. An example of "high" is when the consumed energy is above 2000 kcal/day, the number of steps is above 10,000 per day, and the metabolic equivalents is above 5 per day. An example of "normal" is when the consumed energy is 1000 to 2000 kcal/day, the number of steps is 2000 to 10,000 per day, and the metabolic equivalents is 1 to 5 per day. An example of "low" is when the consumed energy is below 1000 kcal/day, the number of steps is below 2000 per day, and the metabolic equivalents is below 1 per day. The level cutoffs are set so that they can be checked in "Help."

[0125] Next, a late key 616, an on time key 617, and an early key 618 are displayed on the display component 38 to select whether the pharmaceutical administration time was late, on time, or early (S112 in FIG. 16A and S112 in FIG. 17A). Examples of the reason for this change include a patient for whom a change in the scheduled administration time is permitted. An example of "late" is when the user has forgotten to take an injection, that is, when it is done later than the scheduled time. An example of "early" is when the user wants to take an injection before going out, that is, when it is done earlier than the scheduled time. Another example of "early" is when the user wants to take an additional injection because the dose was too low the previous time. The level cutoffs are set so that they can be checked in "Help."

[0126] When these four conditions are inputted, an input confirmation screen is displayed on the display component 38 (S113 in FIG. 16A and S113 in FIG. 17A). On this input confirmation screen are displayed a display component 619 on which a change reason is displayed, an OK key 620, and an "Again" key 621 for setting the change reason again. If the user wishes to take an injection after confirmation, the above-mentioned OK key 620 is selected, and if the user wishes to redo a reason selection, the again key 621 is selected.

[0127] When the OK key 620 is operated, information related to the change reason (an example of pharmaceutical injection amount setting conditions) and the adjustment amount is transmitted to the health care worker-use information terminal 500 over the network 400 (S113, S 114, and S 115 in FIG. 16A, 16B and S113 in FIG. 17A).

[0128] When the change reason is transmitted, a screen indicating "under inquiry" is displayed on the display component 38 (S116 in FIG. 16B and S116 in FIG. 17A).

[0129] When an end key 622 is pressed on the under inquiry screen (S117 in FIG. 16B), the power is switched off.

2-2 Injection Amount Change

[0130] FIG. 18A is a flowchart of the method for controlling the pharmaceutical injection system in this embodiment. S100 in FIG. 18A, in which change conditions, etc., are inputted from the input component 39, indicates S101 to S114 in FIG. 16A.

[0131] As discussed above, information related to the change reason (an example of pharmaceutical injection amount setting conditions) and the adjustment amount is transmitted from the portable terminal 300 to the health care worker-use information terminal 500 (S115 in FIG. 16B and S115 in FIG. 18A).

[0132] The health care worker-use information terminal 500 can receive the change reason and information related to the adjustment amount via the communication component 47 (S301 in FIG. 18A). The health care worker then uses the health care worker-use information terminal 500 to input a change (increase or decrease) in the pharmaceutical injection amount from the input component 51 in a state in which the above are displayed on the display component 50 (S302 in FIG. 18A).

[0133] The pharmaceutical amount finally set by the health care worker, the name of the patient 200, and the date are then recorded in the memory 49 along with the conditions inputted by the patient 200 (such as the above-mentioned blood glucose level, meal size, amount of activity, and other information) (S303 in FIG. 18A).

[0134] Also, the pharmaceutical amount finally set by the health care worker (an example of the pharmaceutical injection amount), the name of the patient 200, and the date are also transmitted to the communication component 36 of the portable terminal 300 via the communication component 47 of the health care worker-use information terminal 500 along with the above-mentioned conditions (such as the above-mentioned blood glucose level, meal size, amount of activity, and other information) (S304 in FIG. 18A).

[0135] When information about the pharmaceutical injection amount is transmitted from the health care worker-use information terminal 500 in a state in which the under inquiry screen is being displayed, the portable terminal 300 receives the information about the pharmaceutical injection amount (S119 in FIG. 16C). This case (when the control proceeds from S116 to S 119) is a case in which the portable terminal 300 receives information related to the pharmaceutical injection amount from the health care worker-use information terminal 500 right away after the physician 501 or other health care worker checks the change reason with the health care worker-use information terminal 500 and sets the dose.

[0136] On the other hand, if the power to the portable terminal 300 is temporarily turned off in S 117 before the information about the pharmaceutical injection amount is received from the health care worker-use information terminal 500, and if the power to the portable terminal 300 is turned back on after the physician 501 has checked the change reason with the health care worker-use information terminal 500 and set the dose, the portable terminal 300 receives the information about the pharmaceutical injection amount (S119 in FIG. 16C).

[0137] Meanwhile, if information about the pharmaceutical injection amount has not been received from the health care worker-use information terminal 500 after the power to the portable terminal 300 is turned on the next time, a screen indicating that the dose is under inquiry is displayed on the display component 38 (S118 in FIG. 16C and S118 in FIG. 17B), and the portable terminal 300 waits to receive the pharmaceutical injection amount.

[0138] Once the portable terminal 300 receives the pharmaceutical injection amount (S119 in FIG. 16C), the controller 35 of the portable terminal 300 records the above-mentioned change reason (such as the above-mentioned blood glucose level, meal size, amount of activity, and other information) and the pharmaceutical amount finally set by the health care worker, the name of the patient 200, and the date in the memory 37 (S121 in FIG. 18A).

[0139] A screen indicating that the administration inquiry is complete is then displayed on the display component 38 of the portable terminal 300 (S122 in FIG. 16C and S122 in FIG. 17B).

[0140] The near field communication component 34 of the portable terminal 300 is then move closer to the near field communication component 25a of the pharmaceutical injection device 100, whereupon the pharmaceutical amount set by the health care worker is transmitted from the portable terminal 300 to the pharmaceutical injection device 100 (S118 in FIG. 18A), and a screen indicating that dose setting is complete is displayed on the display component 38 (S124 in FIG. 16C and S124 in FIG. 17B).

[0141] The pharmaceutical injection device 100 then receives the pharmaceutical amount set by the health care worker (S401 in FIG. 18A).

[0142] The pharmaceutical injection device 100 records the pharmaceutical amount set by the health care worker in the memory 32 (S402 in FIG. 18A).

2-3 Pharmaceutical Injection

[0143] The injection of the pharmaceutical is executed on the basis of the pharmaceutical amount recorded to the memory 32. FIG. 18B is a flowchart of the pharmaceutical injection and the subsequent operation.

[0144] In injecting the pharmaceutical, the controller 25 executes the above-mentioned pharmaceutical injection operation shown in FIGS. 6 and 7 on the basis of the pharmaceutical amount stored in the memory 32 (S403 in FIG. 18B).

[0145] That is, the injection of the pharmaceutical in the pharmaceutical cartridge 9 is commenced by pressing the pharmaceutical injection switch 4 (see FIG. 3) provided to the outer peripheral surface of the main body case 1, as shown in FIGS. 6 and 7.

[0146] More specifically, the motor 13 of the piston drive mechanism 101 is actuated, the gear 12 linked to

the motor 13 rotates, and this rotation of the gear 12 turns the feed screw 11, converting to the linear motion of the piston 10.

[0147] When the piston 10 moves downward (insertion direction C), the distal end of the piston 10 hits a gasket (not shown) at the rear end of the pharmaceutical cartridge (see FIG. 7). After that, the piston 10 is moved, causing the pharmaceutical inside the pharmaceutical cartridge 9 to go through the injection needle 16 mounted to the tip of the pharmaceutical cartridge 9 and be injected under the skin of the patient 200.

[0148] When the pharmaceutical injection operation ends, the pharmaceutical injection device 100 records the pharmaceutical administration history (administration log) in the memory 32 (S404 in FIG. 18B). This pharmaceutical administration history (administration log) includes the amount of pharmaceutical injected under the skin, the change reason transmitted to the health care worker-use information terminal 500 when the pharmaceutical injection amount is set, and so forth. Aside from the change reason, information related to the adjustment amount transmitted to the health care worker-use information terminal 500 when the pharmaceutical injection amount is set (such as information about the selection of the low key 613 or the high key 615) may also be transmitted.

[0149] After this pharmaceutical injection operation, the pharmaceutical administration history (administration log) is transmitted from the pharmaceutical injection device 100 to the portable terminal 300 (S405 in FIG. 18B).

[0150] The portable terminal 300 receives the pharmaceutical administration history (administration log) from the pharmaceutical injection device 100 (S210 in FIG. 16D and S124 in FIG. 18B).

[0151] Upon receiving the administration history, the portable terminal 300 records the pharmaceutical administration history (administration log) in the memory 32 (S211 in FIG. 16D and S125 in FIG. 18B).

[0152] After this, the portable terminal 300 transmits the pharmaceutical administration history (administration log) to the health care worker-use information terminal 500 (S126 in FIG. 18B), and the power is turned off (S212 in FIG. 16D).

[0153] Upon receiving the pharmaceutical administration history (administration log) and the change reason, etc., from the pharmaceutical injection device 100 (S305 in FIG. 18B), the health care worker-use information terminal 500 records the pharmaceutical administration history (administration log) in the memory 49 (S306 in FIG. 18B).

[0154] Meanwhile, if the inject key 602 is selected in S102, an inquiry about the dose is transmitted to the health care worker-use information terminal 500 in order to confirm whether the pharmaceutical injection amount is the reference injection amount, and there is no problem (S201 in FIG. 16B). To put this another way, there is an inquiry as to whether no change is needed.

[0155] When the transmission is performed, an under inquiry screen is displayed (S116 in FIG. 16B and S116 in FIG. 17A).

[0156] Since the rest of the control is the same as above, it will not be described again. As to the change reason received by the portable terminal 300 in S121, if the health care worker is of the same opinion as the patient 200 and determines there is no need for adjustment, then "no change" is recorded.

[0157] Thus, in this embodiment, when the patient 200 inputs a desire to change the pharmaceutical injection amount according to his own condition and health management situation as in FIG. 17A from his own portable terminal 300, this desire is transmitted over the network 400 to the health care worker-use information terminal 500.

[0158] The health care worker examines the pharmaceutical change in light of this desire and the change reason (such as the above-mentioned blood glucose level, meal size, amount of activity, and other information), and sends it back from the health care worker-use information terminal 500 over the network 400 to the portable terminal 300 of the patient 200.

[0159] The patient 200 can transmit this result via the near field communication component 34 of the portable terminal 300 to the near field communication component 25a of the pharmaceutical injection device 100, and thereby change the pharmaceutical injection amount.

[0160] This final pharmaceutical dose (injection amount) is then stored along with the date, the change reason (such as the above-mentioned blood glucose level, meal size, amount of activity, and other information) in the memory 49 of the health care worker-use information terminal 500 and the memory 37 of the portable terminal 300.

[0161] Therefore, the health care worker and the patient 200 can cooperate on future improvements on the basis of this data at the time of later consultation.

[0162] More specifically, FIG. 19 shows what is displayed on the display component 50 of the health care worker-use information terminal 500 and on the display component 38 of the portable terminal 300 owned by the patient 200.

[0163] The display on the display component 50 of the health care worker-use information terminal 500 shown in FIG. 19 can be produced by operating the input component 51. Also, the display on the display component 38 of the portable terminal 300 can be produced by operating the input component 39.

[0164] In FIG. 19, A is the date, B is the dose (injection amount), C is the change reason (such as the above-mentioned blood glucose level, meal size, amount of activity, and other information), D is the reference dose set for each patient 200, E is the adjusted dose, and F is the change in blood glucose level. Also, a is the amount of activity, b is the blood glucose level, and c is the meal size.

[0165] The health care worker can use the health care worker-use information terminal 500 to set a determina-

tion criterion for determining the validity of the adjustment amount of the pharmaceutical dose. The validity of the adjustment amount change due to the change reason transmitted from the portable terminal 300 is determined on the basis of this determination criterion.

[0166] Reasons for increasing the adjustment amount are when the blood glucose level is high, when the meal size is large, when the amount of activity is low, and when the administration date is late, and one point can be added for each. Specifically, when the blood glucose level is high, when the meal size is large, when the amount of activity is low, and when the administration date is late, this results in a total of four points.

[0167] Cases when no adjustment is needed are when the blood glucose level is normal, when the meal size is normal, when the amount of activity is normal, and when the administration date is as scheduled, in which cases no points are added, and if all of these categories are normal, this results in a total of zero points.

[0168] Reasons for decreasing the adjustment amount are when the blood glucose level is low, when the meal size is small, when the amount of activity is high, and when the administration date is early, and one point can be subtracted for each. Specifically, when the blood glucose level is low, when the meal size is small, when the amount of activity is high, and when the administration date is early, this results in a total of minus four points.

[0169] The health care worker can set the determination criterion so that the adjustment amount is set higher when there is a total of 2 to 4 points, no adjustment is performed when the point total is from -1 to +1, and the adjustment amount is set lower when the point total is from -4 to -2. Further, if the reference dose is 40 U, for example, the higher dose can be set to 42 U, for example, and the lower dose to 38 U. Thus, the health care worker sets the dose high or low and sets the determination criterion from the point total for setting the adjustment amount high, normal, or low.

[0170] That is, the dose set on February 26 was 40 U, but on February 27 the patient did some exercise (a), but the blood glucose level (b) was high and the meal size (c) was large, so the point total was +1. Therefore, it is determined from the above determination criterion not to perform adjustment, and the resulting pharmaceutical dose is 40 U.

[0171] By contrast, on February 28, the blood glucose level (b) was low and the meal size (c) was also small, so the point total is -2 points. Accordingly, it is decided from the determination criterion to set the adjustment amount lower, so the pharmaceutical dose is set to 38 U, which is 2 U lower than the reference dose of 40 U.

[0172] On March 1, the amount of activity was low (a), the blood glucose level (b) was high, and the meal size (c) was large, so the point total is +3 points. Therefore, it is decided from the determination criterion to set the adjustment amount higher, so the pharmaceutical dose is set to 42 U, which is 2 U higher than the reference dose of 40 U.

[0173] A higher amount of activity (a) is a reason for decreasing the dose, so this is shown below the line L and in a lighter color. On the other hand, a lower amount of activity (a) is a reason for increasing the dose, so this is shown above the line L and in a darker color. A lower blood glucose level (b) is a reason for decreasing the dose, so this is shown below the line L and in a lighter color. On the other hand, a higher blood glucose level (b) is a reason for increasing the dose, so this is shown above the line L and in a darker color. A smaller meal size (c) is a reason for decreasing the dose, so this is shown below the line L and in a lighter color. On the other hand, a larger meal size (c) is a reason for increasing the dose, so this is shown above the line L and in a darker color.

[0174] When FIG. 19 is displayed on the display component 50 of the health care worker-use information terminal 500 and on the display component 38 of the portable terminal 300 owned by the patient 200, the health care worker and the patient 200 can share, in an easy to understand fashion, specific measures to take in the future. Therefore, a future improvement plan can be carried out more easily.

3. Main Features

3-1

[0175] The pharmaceutical injection system in this embodiment comprises the pharmaceutical injection device 100 for injecting a pharmaceutical, the portable terminal 300 for setting a pharmaceutical injection amount for the pharmaceutical injection device 100, and the health care worker-use information terminal 500 that is capable of communicating with the portable terminal 300.

[0176] The portable terminal 300 has the input component 39 (an example of a first input component), the communication component 36 (an example of a first transmitter, and an example of a first receiver), and the near field communication component 34 (an example of a second transmitter). The input component 39 is used to input pharmaceutical injection amount setting conditions for setting the pharmaceutical injection amount. The communication component 36 transmits the inputted pharmaceutical injection amount setting conditions to the health care worker-use information terminal 500. The communication component 36 receives a pharmaceutical injection amount set on the basis of the pharmaceutical injection amount setting conditions transmitted from the health care worker-use information terminal 500. The near field communication component 34 transmits the received pharmaceutical injection amount to the pharmaceutical injection device 100.

[0177] The health care worker-use information terminal 500 has the communication component 47 (an example of a second receiver, and an example of a third transmitter) and the input component 51 (an example of a second input component). The communication compo-

nent 47 receives the pharmaceutical injection amount setting conditions transmitted from the portable terminal 300. The input component 51 is used to input the pharmaceutical injection amount set on the basis of the received pharmaceutical injection amount setting conditions. The communication component 47 transmits the inputted pharmaceutical injection amount to the portable terminal 300.

[0178] The pharmaceutical injection device 100 has the cartridge holder 7, the main body case 1, the piston 10, the piston drive mechanism 101, the near field communication component 25a (an example of a third receiver), and the controller 25. The cartridge holder 7 allows the pharmaceutical cartridge 9 to be mounted to it. The cartridge holder 7 is provided openably and closeably to the main body case 1. The piston 10 can be inserted into the pharmaceutical cartridge 9 mounted to the cartridge holder 7 inside the main body case 1. The piston drive mechanism 101 moves the piston 10 so that it is inserted into the pharmaceutical cartridge 9. The near field communication component 25a receives the pharmaceutical injection amount transmitted from the portable terminal 300. The controller 25 drives the piston drive mechanism 101 on the basis of the received pharmaceutical injection amount.

[0179] In this embodiment, for example, when pharmaceutical injection amount setting conditions are inputted by the patient from the input component 39 of the portable terminal 300, the pharmaceutical dose set by the health care worker is transmitted through the portable terminal 300 to the pharmaceutical injection device 100, so the pharmaceutical dose can be changed without having to go to a medical facility, which is extremely convenient for the user.

3-2

[0180] Also, in the above embodiment, the portable terminal 300 further has the memory 37 (an example of a first memory) and the display component 38 (an example of a first display component). The memory 37 stores the pharmaceutical injection amount setting conditions inputted to the input component 39 (the first input component) and the pharmaceutical injection amount received from the health care worker-use information terminal 500. The display component 38 displays the pharmaceutical injection amount and the pharmaceutical injection amount setting conditions stored in the memory 37 in graph format. The health care worker-use information terminal 500 further has the memory 49 (an example of a second memory) and the display component 50 (an example of a second display component). The memory 49 stores the pharmaceutical injection amount setting conditions transmitted from the portable terminal 300 and the pharmaceutical injection amount inputted from the input component 51 (an example of a second input component). The display component 50 (an example of a second display component) displays the pharmaceutical injection amount and the pharmaceutical injection amount setting conditions stored in the memory 49 in graph format.

[0181] Accordingly, the pharmaceutical injection amount and the pharmaceutical injection amount setting conditions stored in the memory 37 can be displayed on the display component 38 of the portable terminal 300 on the basis of an instruction from the input component 39. Also, the pharmaceutical injection amount and the pharmaceutical injection amount setting conditions stored in the memory 49 can be displayed on the display component 50 of the health care worker-use information terminal 500 on the basis of an instruction from the input component 51.

[0182] In other words, the patient and the health care worker can each continuously store the pharmaceutical injection amount and the pharmaceutical injection amount setting conditions with the portable terminal 300 and the health care worker-use information terminal 500, respectively, and they can also do visual checks, which makes it easier to deal with disease, and convenience is good from this standpoint as well.

3-3

[0183] With the pharmaceutical injection system in this embodiment, the change reason (an example of pharmaceutical injection amount setting conditions) and information related to an adjustment amount for adjusting the pharmaceutical injection amount are inputted to the input component 39 (an example of a first input component). The communication component 36 (an example of a first transmitter) transmits information related to the adjustment amount to the health care worker-use information terminal 500. A determination criterion that is set in order to determine the validity of an adjustment amount is inputted to the input component 51 (an example of a second input component). The health care worker-use information terminal 500 further has the display component 50 (an example of a second display component). The display component 50 displays the adjustment amount, the change reason (an example of pharmaceutical injection amount setting conditions), and the determination result based on the determination criterion. The communication component 47 (an example of a third transmitter) transmits advice to the patient 200 (an example of a user) and evaluation comments inputted via the input component 51 on the basis of the determination result to the portable terminal 300 along with the determination result.

[0184] This allows the patient 200 to receive advice without a visit to the physician 501.

3-4

[0185] The method for controlling the pharmaceutical injection system of the above embodiment is a method for controlling a pharmaceutical injection system comprising the pharmaceutical injection device 100 for inject-

ing a pharmaceutical, the portable terminal 300 for setting a pharmaceutical injection amount for the pharmaceutical injection device 100, and the health care worker-use information terminal 500 that is capable of communicating with the portable terminal 300, said method comprising S100 (an example of a first input step), S115 (an example of a first transmission step), S301 (an example of a first reception step), S302 (an example of a second input step), S304 (an example of a second transmission step), S116 (an example of a second reception step), S118 (an example of a third transmission step), S401 (an example of a third reception step), and S402 (an example of a storage step).

[0186] S100 (an example of a first input step) is a step of inputting pharmaceutical injection amount setting conditions for setting a pharmaceutical injection amount. S115 (an example of a first transmission step) is a step of transmitting the inputted pharmaceutical injection amount setting conditions from the portable terminal 300 to the health care worker-use information terminal 500. S301 (an example of a first reception step) is a step in which the health care worker-use information terminal 500 receives the pharmaceutical injection amount setting conditions transmitted from the portable terminal 300. S302 (an example of a second input step) is a step in which the pharmaceutical injection amount set on the basis of the received pharmaceutical injection amount setting conditions is inputted to the health care worker-use information terminal 500. S304 (an example of a second transmission step) is a step of transmitting the inputted pharmaceutical injection amount from the health care worker-use information terminal 500 to the portable terminal 300. S116 (an example of a second reception step) is a step in which the portable terminal 300 receives the pharmaceutical injection amount transmitted from the health care worker-use information terminal 500. S118 (an example of a third transmission step) is a step of transmitting the received pharmaceutical injection amount from the portable terminal 300 to the pharmaceutical injection device 100. S401 (an example of a third reception step) is a step in which the pharmaceutical injection device 100 receives the pharmaceutical injection amount transmitted from the portable terminal 300. S402 (an example of a storage step) is a step of storing the received pharmaceutical injection amount in the pharmaceutical injection device 100.

4. Other Embodiments

[0187] An embodiment of the present invention is described above, but the present invention is not limited to or by the above embodiment, and various modifications are possible without departing from the gist of the invention.

(A)

[0188] In the above embodiment, blood glucose level, meal size, and amount of activity are provided as reasons for changing the pharmaceutical injection amount, and determination criteria (in the above embodiment, high (large) (-4 to -2), normal (-2 to 2), and low (small) (2 to 4)) are provided so as to change the adjustment amount in three stages (high (large), normal, and low (small)) on the basis of the point total, with each reason accounting for one point, but the change reasons may be weighted and the determination criteria may be provided so that the adjustment amount is changed in five stages.

[0189] For example, the weighting of the change reasons can be set as follows. In the case of blood glucose level, 2 points can be given for "high," 0 points for "normal," and -2 points for "low." In the case of meal size, +1.5 points can be given for "large," 0 points for "normal," and -1.5 points for "small." For amount of activity, +1 point can be given for "high," 0 points for "normal," and -1 point for "low." If the administration date is given as another change reason, +0.5 point can be given for "late," 0 points for "normal," and -0.5 point for "early."

[0190] The determination criteria can also be such that an adjustment amount level 1 is determined when the point total is at least 3 and no more than 5, an adjustment amount level 2 is determined when the point total is at least 1.5 and less than 3, an adjustment amount level 3 is determined when the point total is greater than -1.5 and no more than 1.5, an adjustment amount level 4 is determined when the point total is greater than -3 and no more than -1.5, and an adjustment amount level 5 is determined when the point total is at least -5 and no more than -3. If we let the reference dose be 40 U, then the amount will be 45 U at adjustment amount level 1, 42 U at adjustment amount level 2, 40 U at adjustment amount level 3, 38 U at adjustment amount level 4, and 35 U at adjustment amount level 5.

[0191] Specifically, if weighting is performed using the data shown in FIG. 19, on February 27 the patient did some exercise (a), but the blood glucose level (b) was high and the meal size (c) was large, so the point total was 2 - 1 + 1.5 = 2.5 points, as shown in FIG. 20. Therefore, the adjustment amount level 2 is determined from the above-mentioned determination reference, and as a result the pharmaceutical dose is set at 42 U.

[0192] By contrast, on February 28, the blood glucose level (b) was low and the meal size (c) was also small, so the point total is -2 - 1.5 = -3.5 points. Therefore, the adjustment amount level 5 is determined from the above-mentioned determination reference, and the pharmaceutical dose is set at 35 U, which is 5 U lower than the reference dose of 40 U.

[0193] On March 1, the amount of activity was low (a), the blood glucose level (b) was high, and the meal size (c) was large, so the point total is 1 + 2 + 1.5 = 4.5 points. Therefore, the adjustment amount level 1 is determined from the above-mentioned determination reference, and as a result the pharmaceutical dose is set at 45 U, which is 5 U higher than the reference dose of 40 U.

[0194] Setting as above may, for example, result in a

situation in which it is unfavorable to lower the adjustment amount, such as when the blood glucose level is high, the meal size is small, the amount of activity is high, and the administration date is early, but such situations can be made less likely to occur by weighting the change reasons.

[0195] When the determination criteria are thus set in five stages, the display screen shown in S107 in FIG. 17A may be changed to the screen shown in FIGS. 21a to 21d.

[0196] In FIG. 17A, since the adjustment amount levels desired by the patient 200 are in three stages, two different keys are displayed, namely, the increase key 605 and the decrease key 606, but in FIG. 21, because there are five stages, four different keys are provided, namely, a high key 620, a somewhat high key 621, a somewhat low key 622, and a low key 623. Specifically, the patient 200 uses the high key 620 to increase the pharmaceutical dose, uses the somewhat high key 621 to increase the pharmaceutical dose somewhat, uses the somewhat low key 622 to decrease the pharmaceutical dose somewhat, and uses the low key 623 to decrease the pharmaceutical dose. Four states are shown in which each of these keys is selected, with the selected key being highlighted.

[0197] Because the patient 200 is the one who performs the key selection, a change in the settings according to the wishes of the patient 200 is not necessarily performed by a health care worker. Therefore, information related to the adjustment amount need not be transmitted to the health care worker-use information terminal 500, but the wishes of the patient can be conveyed to the health care worker by transmitting the adjustment amount level desired by the patient 200 (an example of information related to the adjustment amount) to the health care worker-use information terminal 500. This allows both parties to be cognizant of adjustment to the pharmaceutical dose, which can be helpful in treatment.

[0198] Furthermore, weighting of the change reasons may also be performed when there are three stages to the adjustment amount.

(B)

[0199] Also, since the portable terminal 300 belonging to the patient 200 is provided with the near field communication component 34, and the health care worker-use information terminal 500 is provided with the near field communication component 52, communication between the portable terminal 300 and the health care worker-use information terminal 500 can be performed between the near field communication component 34 and the near field communication component 52 using near field communication, without going over the network 400.

[0200] The near field communication component 52 provided to the health care worker-use information terminal 500 need not be provided if no near field communication is to be performed.

(C)

[0201] In the above embodiment, the health care worker transmits the final dose (injection amount) of the pharmaceutical along with the date and so forth to the portable terminal 300, but a determination result, comments, advice, and so forth from the physician 501 may also be transmitted.

[0202] FIG. 22 is a flowchart of the operation of the pharmaceutical injection system when a determination result, comments, advice, and so forth from the physician 501 are transmitted from the health care worker-use information terminal 500 to the portable terminal 300. FIG. 22 differs from FIG. 18A in that S127 to S129 and S307 to S309 are added.

[0203] In S306, a diagnosis is made by the physician 501 after the health care worker-use information terminal 500 has recorded the pharmaceutical administration history (administration log) in the memory 49.

[0204] Next, a determination result, comments, advice, and so forth from the physician 501 are inputted through the input component 51 to the health care worker-use information terminal 500 (S307 in FIG. 22), and the determination result, comments, advice, and so forth are stored in the memory 49 (S308 in FIG. 22).

[0205] Next, the determination result, comments, advice, and so forth are transmitted from the communication component 47 of the health care worker-use information terminal 500 to the portable terminal 300 (S309 in FIG. 22).

[0206] Upon receiving the determination result, comments, advice, and so forth (S127 in FIG. 22), the portable terminal 300 stores them in the memory 37 via the communication component 36 (S128 in FIG. 22).

[0207] The portable terminal 300 then displays the received determination result, comments, advice, and so forth on the display component 38 (S129 in FIG. 22).

[0208] An example of the determination result, comments, advice, and so forth from the physician 501 will now be described.

(C-1)

[0209] FIG. 23 shows an example of the determination result, comments, advice, and so forth from the physician 501. In FIG. 23, an example is shown in which there are five stages of adjustment amount, with the change reasons weighted as shown in FIG. 20.

[0210] This example shows the adjustment amount inputted by the patient 200 on the administration date, the change reason, the valid adjustment amount at the health care worker-use information terminal 500, the determination result and evaluation comments by the physician 501, and advice to the patient 200. The determination result and comments may be transmitted once a week, for example.

[0211] On February 27, for instance, the patient 200 wishes to increase the adjustment amount somewhat,

and since the valid adjustment amount according to the health care worker-use information terminal 500 of the physician 501 calls for increasing somewhat, the adjustment amounts match, and the determination result is "good." Also, a comment from the physician 501 of "Since blood glucose was low the next day, either the dose may not be adjusted, or activity may be reduced" is transmitted to the portable terminal 300.

[0212] Meanwhile, on February 28, the patient 200 wishes to decrease the adjustment amount somewhat, but since the blood glucose level is low, the meal size is small, the amount of activity is normal, and the administration date is as scheduled, the point total is -2 - 1.5 = -3.5. Therefore, the physician 501 determines that a decrease is appropriate for the adjustment amount. Also, the physician 501 gives a determination result of "fair," and comments "A small adjustment amount is preferable, but a higher blood glucose level the next day may be a result of that."

[0213] As discussed above, the patient 200 can manage his own health on the basis of advice from the physician 501 by having the physician transmit comments. Specifically, if the adjustment amount desired by the patient 200 matches the adjustment amount ultimately decided by the physician 501, the determination result is marked "good." If the adjustment amount desired by the patient 200 is higher or somewhat higher, and the adjustment amount ultimately decided by the physician 501 is somewhat higher or higher, the determination result is marked with "fair." Also, if the adjustment amount desired by the patient 200 is lower or somewhat lower, and the adjustment amount ultimately decided by the physician 501 is somewhat lower or lower, the determination result is marked with "fair."

[0214] If, for example, the valid determination result is somewhat lower or lower, even though the patient 200 desires an adjustment amount that is somewhat higher or higher, or if the valid determination result is somewhat higher or higher, even though the patient 200 desires an adjustment amount that is somewhat lower or lower, the determination result is marked "no good," and a comment is left to the effect that there is an error in the adjustment.

(C-2)

[0215] FIG. 24 shows an example of determination results, comments, advice, and so forth from the physician 501 when the change reasons are weighted and there are three stages to the adjustment amount.

[0216] The weighting of the change reasons can be set as follows, for example. In the case of blood glucose level, 2 points can be given for "high," 0 points for "normal," and -2 points for "low." In the case of meal size, +1.5 points can be given for "large," 0 points for "normal," and -1.5 points for "small." For amount of activity, +1 point can be given for "high," 0 points for "normal," and -1 point for "low." If the administration date is given as another change reason, +0.5 point can be given for "late," 0 points for "normal," and -0.5 point for "early."

[0217] As a valid adjustment amount, it is set higher (42 U) if the point total is 2.5 to 5 points, set to no adjustment (40 U) if the point total is -2 to 2 points, and set lower (38 U) if the point total is -2.5 to -5 points.

[0218] For example, on February 26, the patient 200 desires no adjustment, and the adjustment amount recommended by the health care worker-use information terminal 500 of the physician 501 is also no adjustment, so the adjustment amounts match, and the determination result is "good."

[0219] Meanwhile, on February 27, the patient 200 desires no adjustment, but the blood glucose level is high, the meal size is large, the amount of activity is high, and the administration date is as scheduled, so the point total is 2 + 1.5 -1 = 2.5. Therefore, the physician 501 determines an increase to be appropriate for the adjustment amount. Also, the physician 501 marks the determination result as "fair," and comments "An increase is preferable for the adjustment amount. Let's reduce meal size."

[0220] As discussed above, the patient 200 can manage his own health on the basis of advice from the physician 501 by having the physician transmit comments. Specifically, if the adjustment amount desired by the patient 200 matches the adjustment amount ultimately decided by the physician 501, the determination result is marked "good." If the adjustment amount desired by the patient 200 is no adjustment or higher, and the adjustment amount ultimately decided by the physician 501 is higher or no adjustment, the determination result is marked with "fair." Also, if the adjustment amount desired by the patient 200 is no adjustment or lower, and the adjustment amount ultimately decided by the physician 501 is lower or no adjustment, the determination result is marked with "fair."

[0221] If the valid determination result is lower, even though the adjustment amount desired by the patient 200 is higher, or if the valid determination result is higher, even though the adjustment amount desired by the patient 200 is lower, etc., the determination result is marked "no good," and a comment is left to the effect that there is an error in the adjustment.

[0222] The adjustment amount may be in three stages, with no weighting performed for each change reason.

(D)

[0223] In the above embodiment, the communication component 36 of the portable terminal 300 served as both an example of the first transmitter of the present invention and as an example of the first receiver, but a transmitter and a receiver may be provided separately.

(E)

[0224] In the above embodiment, the communication component 47 of the health care worker-use information terminal 500 served as both an example of the third trans-

mitter of the present invention and as an example of the second receiver, but a transmitter and a receiver may be provided separately.

Embodiment 2

[0225] Next, the pharmaceutical injection system in Embodiment 2 pertaining to the present invention will be described.

[0226] The pharmaceutical injection system in Embodiment 2 differs from the one in Embodiment 1 in that no portable terminal is provided, and a change to the adjustment amount is made by the pharmaceutical injection device to which pharmaceutical amount adjustment conditions have been inputted by the physician 501 ahead of time. Therefore, the patient 200 does not have to visit the physician 501 every time he wishes to change the adjustment amount, making the system more convenient.

[0227] Specifically, in Embodiment 1 the portable terminal 300 is used for inputting change reasons 1 to 4, but in Embodiment 2 the change reasons to 4 are inputted with the pharmaceutical injection device, and changes to the adjustment amount are made by using setting information inputted from the health care worker-use information terminal ahead of time, at the pharmaceutical injection device on the basis of the result of inputting the change reasons to 1 to 4.

1. Configuration

Pharmaceutical Injection System

[0228] FIG. 25 shows the configuration of the pharmaceutical injection system in Embodiment 2. As shown in FIG. 25, the pharmaceutical injection system in Embodiment 2 comprises a pharmaceutical injection device 1100 and a health care worker-use information terminal 500.

[0229] The pharmaceutical injection device 1100 is capable of near field communication with the health care worker-use information terminal 500, and receives pharmaceutical amount adjustment from the health care worker-use information terminal 500 when the patient 200 visits the physician 501.

Pharmaceutical Injection Device

[0230] The pharmaceutical injection device 1100 in this embodiment has the same basic structure as in Embodiment 1, but comprises a setting information memory 1101 for adjusting the pharmaceutical amount, a change reason weighting determination component 1102, an injection amount calculation processor 1103, etc. In Embodiment 2, components that are the same as in Embodiment 1 will not be described again.

[0231] FIG. 26 is a control block diagram of the pharmaceutical injection device 1100 in Embodiment 2. The pharmaceutical injection device 1100 in Embodiment 2 has the configuration of the pharmaceutical injection device 100, but there is also configuration not shown in FIG. 26 (for instance, the display component 5 is connected to the display circuit 31, but this is not shown in FIG. 26).

[0232] A controller 1025 of the pharmaceutical injection device 1100 in Embodiment 2 is provided with a memory 32 that includes the setting information memory 1101 and an administration log memory 1104, the change reason weighting determination component 1102, the injection amount calculation processor 1103, a power supply controller 1105, a display operation controller 1106, an injection controller 1107, a cartridge/needle mounting detector 1108, a motor rotation controller 1109, a piston movement distance sensor 1110, a communication controller 1111, a time management controller 1112, a buzzer control circuit 29, a motor control circuit 27, and a timer 33.

[0233] The setting information memory 1101 is a part of the memory 32, and stores setting information for adjusting and setting the pharmaceutical injection amount that is inputted by the physician 501 to the health care worker-use information terminal 500 and received through the near field communication component 25a.

[0234] The change reason weighting determination component 1102 performs weighting when changing from the reference dose on the basis of the change reasons inputted by the patient 200 from the display component 5.

[0235] The injection amount calculation processor 1103 calculates an adjustment amount on the basis of the point total for each change reason after weighting, and adds the adjustment amount to the reference dose to calculate the pharmaceutical injection amount.

[0236] The administration log memory 1104 is a part of the memory 32, and stores a pharmaceutical administration history (administration log).

[0237] The power supply controller 1105 controls the power switch 2 and the battery 26, and supplies power when the power switch 2 is pressed.

[0238] The display operation controller 1106 is connected to the display component 5 via the display circuit 31, and is also connected to the setting switches 6 and the pharmaceutical inject switch. More specifically, the keys displayed on the display component 5 can be selected with the setting switches 6 under control of the display operation controller 1106. As shown in FIG. 2, there are three setting switches 6, so the middle key can be an enter key, and the keys on either side can be select keys for moving up and down. When a plurality of keys are displayed on the display component 5 (S103 in FIG. 17A), up and down selection is performed with the select keys, and the selected key can be entered with the enter key. Thus, in Embodiment 2, the patient 200 uses the setting switches 6 to manipulate the keys displayed on the display component 5, and thereby inputs the change reasons and so forth described in Embodiment 1.

[0239] The injection controller 1107 controls the motor

control circuit 27 via the motor rotation controller 1109 on the basis of the movement distance of the piston sensed by the piston movement distance sensor 1110 using the encoder 28 and the home point sensor 23. The injection controller 1107 is also connected to the cartridge/needle mounting detector 1108, and the cartridge/needle mounting detector 1108 detects the mounting of the cartridge and needle on the basis of the detection results of the injection needle detector switch 15 and the opening and closing detector switch 24.

[0240] The communication controller 1111 controls communication with the near field communication component 52 of the health care worker-use information terminal 500 by the near field communication component 25a.

[0241] The time management controller 1112 manages control of the timer 33.

[0242] The configuration of the health care worker-use information terminal 500 is the same as in Embodiment 1.

2. Operation

Operation of Pharmaceutical Injection System

[0243] FIG. 27 is a flowchart of the control of the pharmaceutical injection system in Embodiment 2.

[0244] As shown in FIG. 27, first setting information is inputted by the physician 501 through the input component 51 (S1310 in FIG. 27). Examples of setting information include the reference dose, the adjustment amount level, change reason data for dose adjustment, combinations of change reasons, and weighting parameters.

[0245] The inputted setting information is transmitted from the near field communication component 52 to the pharmaceutical injection device 1100 by communication between the near field communication component 25a of the pharmaceutical injection device 1100 and the near field communication component 52 of the health care worker-use information terminal 500 when the patient 200 visits the physician 501 (S1320 in FIG. 27).

[0246] When the setting information is transmitted from the near field communication component 52 to the pharmaceutical injection device 1100, the pharmaceutical injection device 1100 performs the following operations.

Operation of Pharmaceutical Injection Device

[0247] The operation of the pharmaceutical injection device in Embodiment 2 will be described for each other components of the pharmaceutical injection device 1100.

Operation of Communication Controller

[0248] FIG. 28 is a flowchart of the operation of the communication controller 1111.

[0249] When the communication controller 1111 receives setting information from the health care worker-use information terminal 500 (S1410 in FIG. 27), the communication controller 1111 controls the near field communication component 25a to start communication processing (S661), after which adjustment amount setting data (setting information) is received and communication end processing is performed as shown in S662 and S663 (S664). Operation of Setting Information Memory

[0250] FIG.29 is a flowchart of the operation of the setting information memory 1101. The setting information memory 1101 receives setting information from the health care worker-use information terminal 500 by performing communication between the near field communication component 25a of the pharmaceutical injection device 1100 and the near field communication component 52 of the health care worker-use information terminal 500 when the patient 200 visits the physician 501 (S610 in FIG. 29 and S1410 in FIG. 27). The pharmaceutical injection device 1100 records the received setting information in the setting information memory 1101 of the memory 32 (S611 in FIG. 29 and S1420 in FIG. 27).

[0251] FIGS. 30A to 30C show setting information transmitted from the health care worker-use information terminal 500 to the pharmaceutical injection device 1100.

[0252] The reference dose and the adjustment amount level are shown in FIG. 30A. When five-stage adjustment is performed according to the point total, the units of the pharmaceutical dose to be increased or decreased are shown in the adjustment amount levels 1 to 5. For example, the reference dose is set to 40 units, and +5 units is set in the case of the adjustment amount level 1. When three-stage adjustment is performed according to the point total, the increase or decrease units are set for the adjustment amount levels 1 to 3. In FIG. 30A, the adjustment amount levels are depicted for three-stage and five-stage, but just one of these may be transmitted to the pharmaceutical injection device 1100. Also, the configuration may be such that both sets of data are transmitted, and the patient 200 can select between five-stage adjustment and three-stage adjustment.

[0253] In FIG. 30B, change reason data is shown for dose adjustment, with blood glucose shown as change reason 1, meal size as change reason 2, activity as change reason 3, and "other" as change reason 4. For each change reason, examples of the text string that is selected include "high," "normal," and "low," and a reference for selecting the text string is given as help. For example, if high is selected for blood glucose level, which is change reason 1, a decision can be made by referring to the text in the help section: "Average blood glucose level for past 2 to 3 days: at least 200 mg/dL, before breakfast: at least 160 mg/dL."

[0254] FIG. 30C shows combinations of change reasons and weighting parameters. Also shown are determination thresholds for the adjustment amount level after weighting of the change reasons. For example, if the point total is +3 to +5, the pharmaceutical injection amount is adjusted to "high" as adjustment amount level 1.

Operation of Display Operation Controller

[0255] The operation of the display operation controller 1106 will now be described. The display operation controller 1106 controls display, etc., in the inputting of change reasons using the display component 5, the setting switches 6, etc. (S1430 in FIG. 27).

[0256] The display on the display component 5 of the pharmaceutical injection device 1100 in Embodiment 2 is the same as those in FIGS. 17A to 17C, and so will be described by using FIGS. 17A to 17C.

[0257] FIG. 31 is a flowchart of the operation of the display operation controller 1106. As shown in FIG. 31, first a menu selection screen is displayed (S600, and S103 in reference FIG. 17A). Here, if the inject key 602 is selected (S601), an injection implementation screen is displayed on the display component 5 (S602), and pharmaceutical injection is performed using the pharmaceutical injection device 1100 in injection mode (S603). Once pharmaceutical injection is implemented, an injection completion screen is displayed on the display component 5 (S604). The display on the injection implementation screen, screen transition in injection mode, the injection completion screen, and so forth will not be described.

[0258] Meanwhile, if the adjust key 603 (S103 in reference FIG. 17A) is selected in S605, the display is given in adjustment mode (S605). The display in adjustment mode is the same up to the display of the adjustment screen in S 105 to S112 described in Embodiment 1, and then a change reason confirmation screen is displayed (S606, and S113 in reference FIG. 17A).

[0259] When OK is then selected in S606, a menu screen displaying the pharmaceutical dose after adjustment is displayed (S608).

Operation of Change Reason Weighting Determination Component

[0260] The operation of the change reason weighting determination component 1102 will now be described. FIG. 32 is a flowchart of the operation of the change reason weighting determination component 1102. The change reason weighting determination component 1102 and the injection amount calculation processor 1103 (below-mentioned) calculate the pharmaceutical injection amount from the inputted change reasons on the basis of the received setting information (S1440 in FIG. 27).

[0261] The change reason weighting determination component 1102 reads weighting parameters for adjustment points from the setting information memory 1101 (S620).

[0262] Then, the change reason weighting determination component 1102 calculates the adjustment points from the selection input for change reason 1 (blood glucose) given by the display operation controller 1106 (S621). Here, for example, if the patient 200 selects "high" for blood glucose in the case of five-stage weighting, the adjustment points for change reason 1 will be +2 points (FIGS. 30B and 30C).

[0263] Then, the change reason weighting determination component 1102 calculates the adjustment points from the selection input for change reason 2 (meal size) given by the display operation controller 1106 (S622). Here, for example, if the patient 200 selects "large" for meal size in the case of five-stage weighting, the adjustment points for change reason 2 will be +1.5 points (FIGS. 30B and 30C).

[0264] Then, the change reason weighting determination component 1102 calculates the adjustment points from the selection input for change reason 3 (activity) given by the display operation controller 1106 (S623). Here, for example, if the patient 200 selects "high" for the amount of activity in the case of five-stage weighting, the adjustment points for change reason 3 will be -1.0 point (FIGS. 30B and 30C).

[0265] Then, the change reason weighting determination component 1102 calculates the adjustment points from the selection input for change reason 4 (other) given by the display operation controller 1106 (S624). Here, for example, if the patient 200 selects "as scheduled" for administration date and time in the case of five-stage weighting, the adjustment points for change reason 4 will be 0 points (FIGS. 30B and 30C).

[0266] Then, the change reason weighting determination component 1102 calculates the point total on the basis of an adjustment point total calculation formula (S625). Using the above-mentioned change reasons 1 to 4 as an example, the point total is 2 + 1.5 - 1 + 0 = 2.5 points. This point total is temporarily stored in the setting information memory 1101.

Operation of Injection Amount Calculation Processor

[0267] The operation of the injection amount calculation processor 1103 will now be described. FIG. 33 is a flowchart of the operation of the injection amount calculation processor 1103.

[0268] The injection amount calculation processor 1103 reads the reference amount, the adjustment amount, and the point total from the setting information memory 1101 (S630).

[0269] Next, the injection amount calculation processor 1103 determines from the point total whether or not the adjustment amount level is 1 (S631). If the point total corresponds to adjustment amount level 1, the adjustment amount of adjustment amount level 1 is added to the reference dose (S637). After this, the injection amount calculation processor 1103 stores the pharmaceutical dose after the addition of the adjustment amount of adjustment amount level 1 in the setting information memory 1101 (S636).

[0270] In S631, if the point total does not correspond to adjustment amount level 1, the injection amount calculation processor 1103 determines whether or not the

point total corresponds to adjustment amount level 2 (S632). If the point total corresponds to adjustment amount level 2, the adjustment amount of adjustment amount level 2 is added to the reference dose (S638). After this, the injection amount calculation processor 1103 stores the pharmaceutical dose after the addition of the adjustment amount of adjustment amount level 2 in the setting information memory 1101 (S636).

[0271] In S632, if the point total does not correspond to adjustment amount level 2, the injection amount calculation processor 1103 determines whether or not the point total corresponds to adjustment amount level 3 (S633). If the point total corresponds to adjustment amount level 3, the adjustment amount of adjustment amount level 3 is added to the reference dose (S639). After this, the injection amount calculation processor 1103 stores the pharmaceutical dose after the addition of the adjustment amount of adjustment amount level 3 in the setting information memory 1101 (S636).

[0272] In S633, if the point total does not correspond to adjustment amount level 3, the injection amount calculation processor 1103 determines whether or not the point total corresponds to adjustment amount level 4 (S634). If the point total corresponds to adjustment amount level 4, the adjustment amount of adjustment amount level 4 is added to the reference dose (S640). After this, the injection amount calculation processor 1103 stores the pharmaceutical dose after the addition of the adjustment amount of adjustment amount level 4 in the setting information memory 1101 (S636).

[0273] In S634, if the point total does not correspond to adjustment amount level 4, the injection amount calculation processor 1103 adds the adjustment amount of adjustment amount level 5 to the reference dose (S635). After this, the injection amount calculation processor 1103 stores the pharmaceutical dose after the addition of the adjustment amount of adjustment amount level 5 in the setting information memory 1101 (S636).

[0274] In the above example, since the point total is +2.5 points, it can be seen from FIG. 30C that this corresponds to adjustment amount level 2, which is "somewhat higher." At adjustment amount level 2, as shown in FIG. 30A, +2 units are added to the reference dose. If we let the reference dose be 40 units, then the pharmaceutical dose after addition becomes 42 units (U). This pharmaceutical dose is stored in the setting information memory 1101.

Operation of Administration Log Memory

[0275] The operation of the administration log memory after completion of pharmaceutical administration will now be described.

[0276] FIG. 34 is a flowchart of the operation of the administration log memory. When pharmaceutical administration is complete (S650, and S1450 in FIG. 27), the administration log memory 1104 acquires the administration date and time from the time management controller 1112 (S651).

[0277] Then, the administration log memory 1104 acquires the change reasons from the change reason weighting determination component 1102 (S652).

[0278] The administration log memory 1104 acquires the adjustment amount and the reference amount if there is to be adjustment in S653 (S656). If there is no adjustment, just the reference amount is acquired (S654).

[0279] Next, the administration log memory 1104 stores the acquired reference amount, or the reference amount and the adjustment amount, in the pharmaceutical administration history (administration log) (S655, and S1460 in FIG. 27).

Operation of Communication Controller

[0280] When the patient 200 visits the physician 501 and tries to examine the pharmaceutical dose, as shown in S665 and S666 in FIG. 28, the communication controller 1111 transmits pharmaceutical administration history (administration log) data to the health care worker-use information terminal 500 via the near field communication component 25a, and performs communication end processing (S664, and S1470 in FIG. 27).

[0281] As shown in S1410 in FIG. 27, the health care worker-use information terminal 500 receives the pharmaceutical administration history (administration log) data through the near field communication component 52.

[0282] The data shown in FIG. 35 (administration date, administration time, reference dose, adjustment dose, etc.) is an example of the data transmitted by the communication controller 1111 to the health care worker-use information terminal 500. Consequently, a graph such as that shown in FIGS. 19 and 20, for example, can be displayed on the health care worker-use information terminal 500, and the physician 501 can give advice to the patient 200.

3. Main Features

3-1

[0283] The pharmaceutical injection device 1100 in Embodiment 2 comprises the cartridge holder 7, the main body case 1, the piston 10, the piston drive mechanism 101, the display component 5, the setting switches 6 (an example of a third input component), the near field communication component 25a (an example of a fourth receiver), the setting information memory 1101, the change reason weighting determination component 1102, and the injection amount calculation processor 1103 (an example of a pharmaceutical injection amount computer).

[0284] The cartridge holder 7 allows the pharmaceutical cartridge 9 to be mounted to it. The cartridge holder 7 is provided openably and closeably to the main body case 1. The piston 10 can be inserted into the pharmaceutical cartridge 9 mounted to the cartridge holder 7 inside the main body case 1. The piston drive mechanism

101 moves the piston 10 so that it is inserted into the pharmaceutical cartridge 9.

[0285] The display component 5 and the setting switches 6 are used by the patient 200 to input pharmaceutical injection amount setting conditions (change reasons, etc.) for setting the pharmaceutical injection amount. The near field communication component 25a is able to receive setting information (reference dose, adjustment amount level, etc.) from the health care worker-use information terminal 500 to which is inputted setting information for setting the pharmaceutical injection amount. The setting information memory 1101 stores the received setting information. The change reason weighting determination component 1102 and the injection amount calculation processor 1103 calculate the pharmaceutical injection amount on the basis of the setting information, from the inputted pharmaceutical injection amount setting conditions.

[0286] Consequently, if the patient 200 wishes to change the pharmaceutical injection amount, the pharmaceutical injection device 1100 can adjust the reference amount by calculating the adjustment amount on the basis of the setting information inputted by the physician 501.

[0287] Accordingly, the patient 200 does not have to visit the physician 501 every time he wishes to change the pharmaceutical injection amount, which is more convenient.

3-2

[0288] The pharmaceutical injection device 1100 in Embodiment 2 further comprises the near field communication component 25a (an example of a fourth transmitter) that transmits information related to the pharmaceutical administration history (administration log) to the health care worker-use information terminal 500.

[0289] This allows the physician 501 to refer to the pharmaceutical administration history (administration log) and give the patient 200 the appropriate advice.

3-3

[0290] The method for controlling a pharmaceutical injection system in Embodiment 2 is a method for controlling a pharmaceutical injection system that comprises the pharmaceutical injection device 1100 for injecting a pharmaceutical, and the health care worker-use information terminal 500 that is able to transmit setting information for setting the pharmaceutical injection amount to the pharmaceutical injection device 1100, said method comprising S1310 (an example of a third input step), S1320 (an example of a fourth transmission step), S1410 (an example of a fourth reception step), S1420 (an example of a second storage step), S1430 (an example of a fourth input step), S1440 (an example of a computation step), and S1460 (an example of a third storage step). S1310 (an example of a third input step) involves inputting a determination criterion for determining the validity of a pharmaceutical injection amount as setting information to the health care worker-use information terminal 500. S1320 (an example of a fourth transmission step) involves transmitting the inputted setting information from the health care worker-use information terminal 500 to the pharmaceutical injection device 1100. S1410 (an example of a fourth reception step) involves the pharmaceutical injection device 1100 receiving the setting information transmitted from the health care worker-use information terminal 500. S1420 (an example of a second storage step) involves storing the received setting information in the pharmaceutical injection device 1100. S1430 (an example of a fourth input step) involves inputting change reasons (an example of pharmaceutical injection amount setting conditions) for setting the pharmaceutical injection amount, to the pharmaceutical injection device 1100. S1440 (an example of a computation step) involves computing the pharmaceutical injection amount on the basis of the setting information, from the inputted change reasons (an example of pharmaceutical injection amount setting conditions). S1460 (an example of a third storage step) involves the pharmaceutical injection device 1100 storing the pharmaceutical injection amount as information related to the pharmaceutical administration history (administration log).

3-4

[0291] The method for controlling a pharmaceutical injection system in Embodiment 2 further comprises S1470 (an example of a fifth transmission step). S1470 (an example of a fifth transmission step) involves transmitting information related to the pharmaceutical administration history (administration log) from the pharmaceutical injection device 1100 to the health care worker-use information terminal 500.

4. Other Embodiments

[0292] Embodiments of the present invention are described above, but the present invention is not limited to or by the above embodiments, and various modifications are possible without departing from the gist of the invention. What was stated in the other embodiments given in Embodiment 1 above can also be suitably applied to Embodiment 2.

(A)

[0293] With the pharmaceutical injection system in Embodiment 2, communication between the pharmaceutical injection device 1100 and the health care worker-use information terminal 500 involves the use of near field communication provided by the near field communication component 25a and the near field communication component 52 (examples of NFC), but this is not the only option, and communication may instead be per-

formed via the Internet or the like.

INDUSTRIAL APPLICABILITY

[0294] With the portable terminal, health care worker-use information terminal, pharmaceutical injection device, and pharmaceutical injection system of the present invention, the pharmaceutical injection amount can be changed without having to go to a treatment facility, which is more convenient for the user, and these are expected to find application to pharmaceutical injection devices and the like that are used for injecting insulin, growth hormones, and so forth.

REFERENCE SIGNS LIST

[0295]

1 main body case
2 power switch
3 injection needle mounting component
4 pharmaceutical injection switch
5 display component
6 setting switch
7 cartridge holder
8 insertion opening
9 pharmaceutical cartridge
10 piston
11 feed screw
12 gear
13 motor
14 opening
15 injection needle detector switch
16 injection needle
17 shaft support
18 eject spring
19 latched component
20 ejector tab
21 spring
22 lever
22a, 22b protrusion
23 home point sensor
24 opening and closing detector switch
25 controller
25a near field communication component (an example of a third receiver, and an example of a fourth receiver)
26 battery
27 motor control circuit
28 encoder
29 buzzer control circuit
30 buzzer
31 display circuit
32 memory
33 timer
34 near field communication component (an example of a second transmitter)
35 controller
36 communication component (an example of a first transmitter, and an example of a first receiver)
37 memory (an example of a first memory)
38 display component (an example of first display component)
39 input component (an example of a first input component)
40 power switch
41 acceleration sensor
42 brightness sensor
43 microphone
44 battery
45 sounder
46 GPS
47 communication component (an example of a second receiver, and an example of a third transmitter)
48 controller
49 memory (an example of a second memory)
50 display component (an example of second display component)
51 input component (an example of a second input component)
52 near field communication component
53 external storage device
100 pharmaceutical injection device (Embodiment 1)
101 piston drive mechanism
200 patient
300 portable terminal
400 network
500 health care worker-use information terminal
501 physician
1100 pharmaceutical injection device (Embodiment 2)

Claims

1. A pharmaceutical injection system, comprising:

a pharmaceutical injection device configured to inject a pharmaceutical;
a portable terminal configured to set a pharmaceutical injection amount for the pharmaceutical injection device; and
a health care worker-use information terminal capable of communicating with the portable terminal,
wherein the portable terminal has:

a first input component configured to have pharmaceutical injection amount setting conditions for setting the pharmaceutical injection amount inputted;
a first transmitter configured to transmit the inputted pharmaceutical injection amount setting conditions to the health care worker-use information terminal;
a first receiver configured to receive the

pharmaceutical injection amount set on the basis of the pharmaceutical injection amount setting conditions transmitted from the health care worker-use information terminal; and
a second transmitter configured to transmit the received pharmaceutical injection amount to the pharmaceutical injection device,

the health care worker-use information terminal has:

a second receiver configured to receive the pharmaceutical injection amount setting conditions transmitted from the portable terminal;
a second input component configured to have the pharmaceutical injection amount set on the basis of the received pharmaceutical injection amount setting conditions inputted; and
a third transmitter configured to transmit the inputted pharmaceutical injection amount to the portable terminal, and

the pharmaceutical injection device has:

a cartridge holder configured to mount a pharmaceutical cartridge thereon;
a main body case having the cartridge holder is openably and closeably provided thereto;
a piston configured to be inserted into the pharmaceutical cartridge mounted to the cartridge holder inside the main body case;
a piston drive mechanism configured to move the piston so as to insert the piston into the pharmaceutical cartridge;
a third receiver configured to receive the pharmaceutical injection amount transmitted from the portable terminal; and
a controller configured to drive the piston drive mechanism on the basis of the received pharmaceutical injection amount.

2. The pharmaceutical injection system according to Claim 1,
wherein the portable terminal further has:

a first memory configured to store the pharmaceutical injection amount setting conditions inputted to the first input component, and the pharmaceutical injection amount received from the health care worker-use information terminal; and
a first display component configured to display in graph format the pharmaceutical injection amount and the pharmaceutical injection amount setting conditions stored in the first memory, and
the health care worker-use information terminal further has:

a second memory configured to store the pharmaceutical injection amount setting conditions transmitted from the portable terminal, and the pharmaceutical injection amount inputted from the second input component; and
a second display component configured to display in graph format the pharmaceutical injection amount and the pharmaceutical injection amount setting conditions stored in the second memory.

3. The pharmaceutical injection system according to Claim 1,
wherein the portable terminal has a first communication component configured to communicate with the pharmaceutical injection device,
the pharmaceutical injection device has a second communication component configured to communicate with the portable terminal,
the first communication component has the second transmitter,
the second communication component has the third transmitter, and
the first communication component and the second communication component use near field communication (NFC).

4. The pharmaceutical injection system according to Claim 1,
wherein information related to an adjustment amount for adjusting the pharmaceutical injection amount and the pharmaceutical injection amount setting conditions are inputted to the first input component,
the first transmitter transmits information related to the adjustment amount to the health care worker-use information terminal,
a determination criterion that is set in order to determine validity of the adjustment amount is inputted to the second input component,
the health care worker-use information terminal further has a second display component configured to display a determination result based on the adjustment amount, the pharmaceutical injection amount setting conditions, and the determination criterion, and
the third transmitter transmits evaluation comments inputted through the second input component on the basis of the determination result, and advice to a user of the pharmaceutical injection device, along with the determination result, to the portable terminal.

5. A portable terminal that sets a pharmaceutical injection amount for a pharmaceutical injection device configured to inject a pharmaceutical, said portable terminal comprising:

a first input component configure to have pharmaceutical injection amount setting conditions for setting the pharmaceutical injection amount inputted;
a first transmitter configured to transmit the inputted pharmaceutical injection amount setting conditions to the health care worker-use information terminal;
a first receiver configured to receive the pharmaceutical injection amount set on the basis of the pharmaceutical injection amount setting conditions transmitted from the health care worker-use information terminal; and
a second transmitter configured to transmit the received pharmaceutical injection amount to the pharmaceutical injection device

6. A health care worker-use information terminal capable of communicating with a portable terminal configured to set a pharmaceutical injection amount for a pharmaceutical injection device configured to inject a pharmaceutical, the health care worker-use information terminal comprising:

a second receiver configured to receive pharmaceutical injection amount setting conditions for setting the pharmaceutical injection amount, transmitted from the portable terminal;
a second input component configured to have the pharmaceutical injection amount set on the basis of the received pharmaceutical injection amount setting conditions inputted; and
a third transmitter configured to transmit the inputted pharmaceutical injection amount to the portable terminal.

7. A pharmaceutical injection device that allows setting of a pharmaceutical injection amount from a portable terminal configured to have pharmaceutical injection amount setting conditions for setting the pharmaceutical injection amount inputted, the pharmaceutical injection device comprising:

a cartridge holder configured to mount a pharmaceutical cartridge thereon;
a main body case having the cartridge holder to be openably and closeably provided thereto;
a piston configured to be inserted into the pharmaceutical cartridge mounted to the cartridge holder inside the main body case;
a piston drive mechanism configured to move the piston so as to insert the piston into the pharmaceutical cartridge;
a third receiver configured to receive from the portable terminal the pharmaceutical injection amount set on the basis of the pharmaceutical injection amount setting conditions; and
a controller configured to drive the piston drive mechanism on the basis of the received pharmaceutical injection amount, and
the pharmaceutical injection amount is transmitted to the portable terminal after being set on the basis of the pharmaceutical injection amount setting conditions transmitted from the portable terminal to the health care worker-use information terminal, and then being inputted to the health care worker-use information terminal.

8. A pharmaceutical injection device, comprising:

a cartridge holder configured to mount a pharmaceutical cartridge thereon;
a main body case having the cartridge holder to be openably and closeably provided thereto;
a piston configured to be inserted into the pharmaceutical cartridge mounted to the cartridge holder inside the main body case;
a piston drive mechanism configured to move the piston so as to insert the piston into the pharmaceutical cartridge;
a third input component configured to have pharmaceutical injection amount setting conditions for setting a pharmaceutical injection amount inputted;
a fourth receiver configured to receive setting information for setting the pharmaceutical injection amount, from a health care worker-use information terminal configure to have the setting information inputted;
a setting information memory configured to store the received setting information; and
a pharmaceutical injection amount computer configured to compute the pharmaceutical injection amount on the basis of the setting information, from the inputted pharmaceutical injection amount setting conditions.

9. The pharmaceutical injection device according to Claim 8, further comprising a fourth transmitter configured to transmit information related to pharmaceutical administration history to the health care worker-use information terminal.

10. A method for controlling a pharmaceutical injection system comprising a pharmaceutical injection device configured to inject a pharmaceutical, a portable terminal configured to set a pharmaceutical injection amount for the pharmaceutical injection device, and a health care worker-use information terminal capable of communicating with the portable terminal, the method for controlling a pharmaceutical injection

system comprising:

a first input step in which pharmaceutical injection amount setting conditions for setting the pharmaceutical injection amount are inputted to the portable terminal;
a first transmission step in which the inputted pharmaceutical injection amount setting conditions are transmitted from the portable terminal to the health care worker-use information terminal;
a first reception step in which the health care worker-use information terminal receives the pharmaceutical injection amount setting conditions transmitted from the portable terminal;
a second input step in which the pharmaceutical injection amount set on the basis of the received pharmaceutical injection amount setting conditions is inputted to the health care worker-use information terminal;
a second transmission step in which the inputted pharmaceutical injection amount is transmitted from the health care worker-use information terminal to the portable terminal;
a second reception step in which the pharmaceutical injection amount transmitted from the health care worker-use information terminal is received by the portable terminal;
a third transmission step in which the received pharmaceutical injection amount is transmitted from the portable terminal to the pharmaceutical injection device;
a third reception step in which the pharmaceutical injection amount transmitted from the portable terminal is received by the pharmaceutical injection device; and
a first storage step in which the received pharmaceutical injection amount is stored by the pharmaceutical injection device.

11. A method for controlling a pharmaceutical injection system comprising a pharmaceutical injection device configured to inject a pharmaceutical and a health care worker-use information terminal capable of transmitting setting information for setting a pharmaceutical injection amount for the pharmaceutical injection device, the method for controlling a pharmaceutical injection system comprising:

a third input step in which a determination criterion for determining validity of the pharmaceutical injection amount as setting information is inputted to the health care worker-use information terminal;
a fourth transmission step in which the inputted setting information is transmitted from the health care worker-use information terminal to the pharmaceutical injection device;
a fourth reception step in which the setting information transmitted from the health care worker-use information terminal is received by the pharmaceutical injection device;
a second storage step in which the received setting information is stored by the pharmaceutical injection device;
a fourth input step in which pharmaceutical injection amount setting conditions for setting the pharmaceutical injection amount are inputted to the pharmaceutical injection device;
a computation step in which the pharmaceutical injection amount is computed on the basis of the setting information from the inputted pharmaceutical injection amount setting conditions; and
a third storage step in which the pharmaceutical injection device stores the pharmaceutical injection amount as information related to pharmaceutical administration history.

12. The method for controlling a pharmaceutical injection system according to Claim 11, further comprising a fifth transmission step in which the information related to pharmaceutical administration history is transmitted from the pharmaceutical injection device to the health care worker-use information terminal.

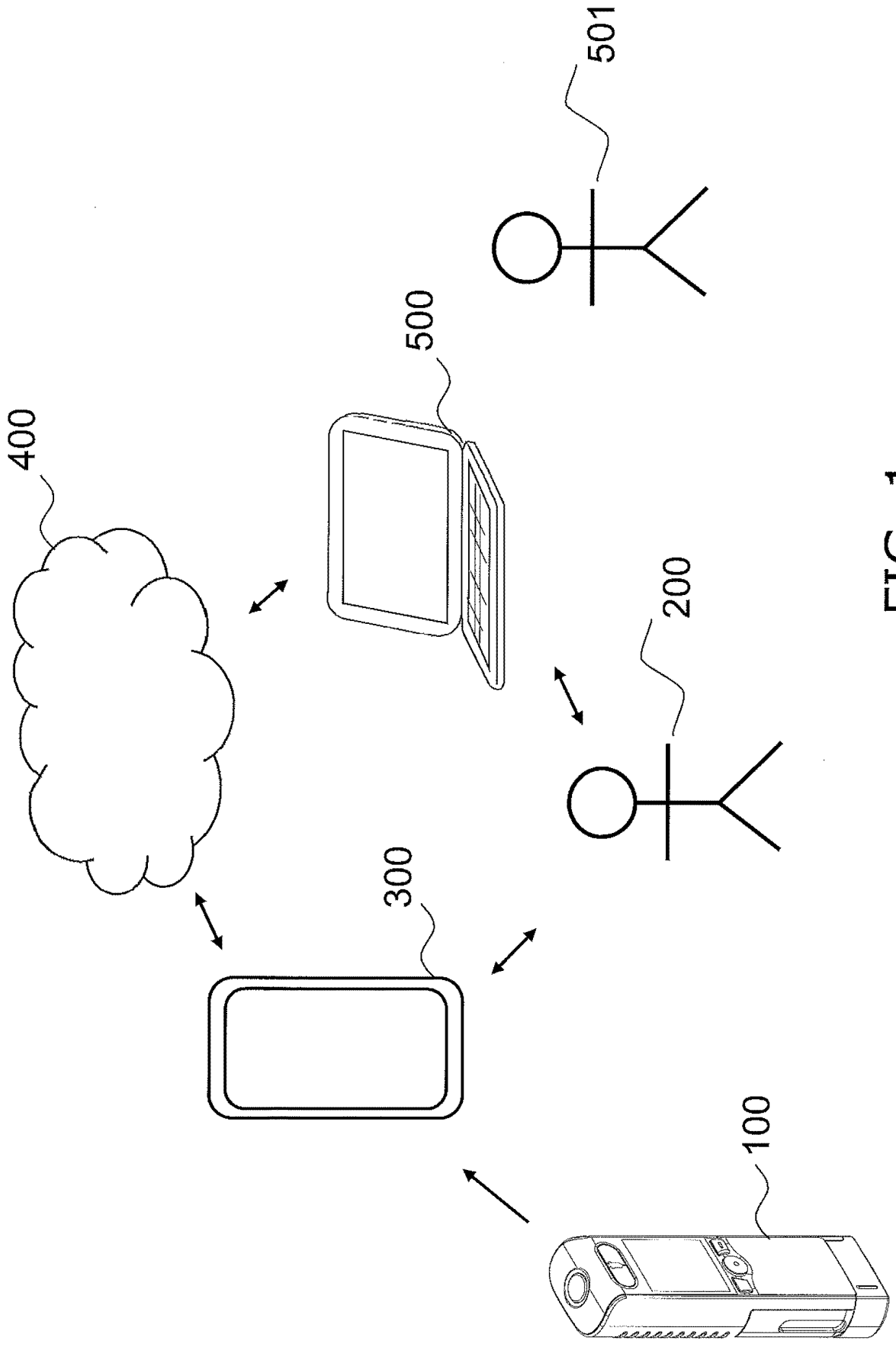


FIG. 1

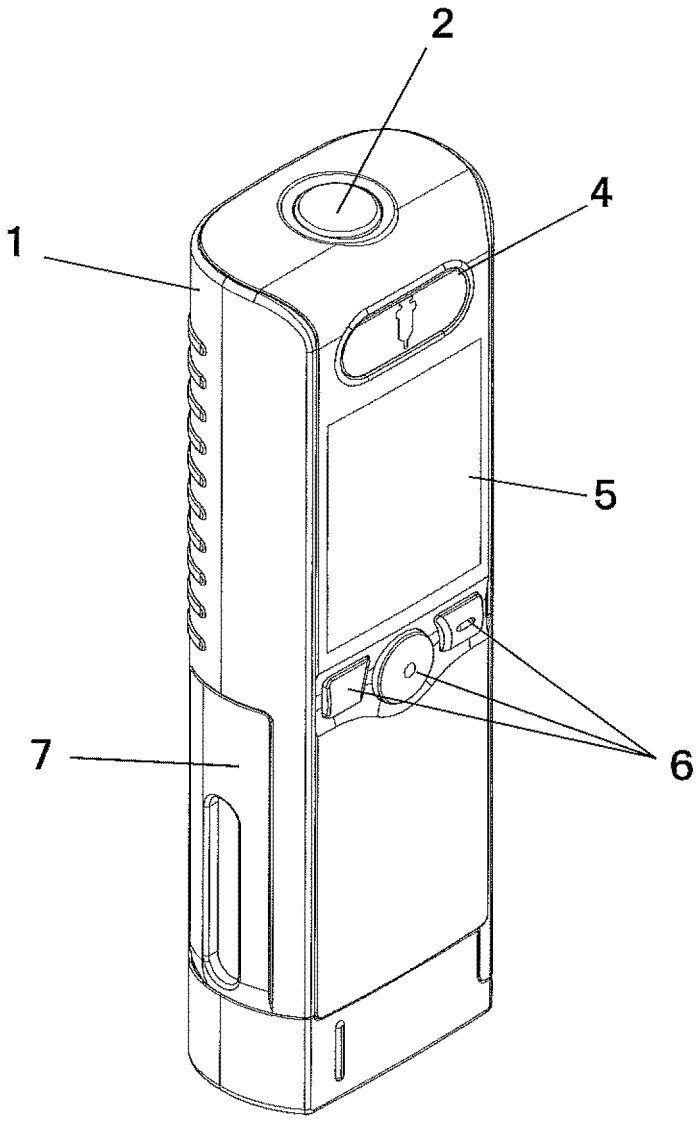


FIG. 2

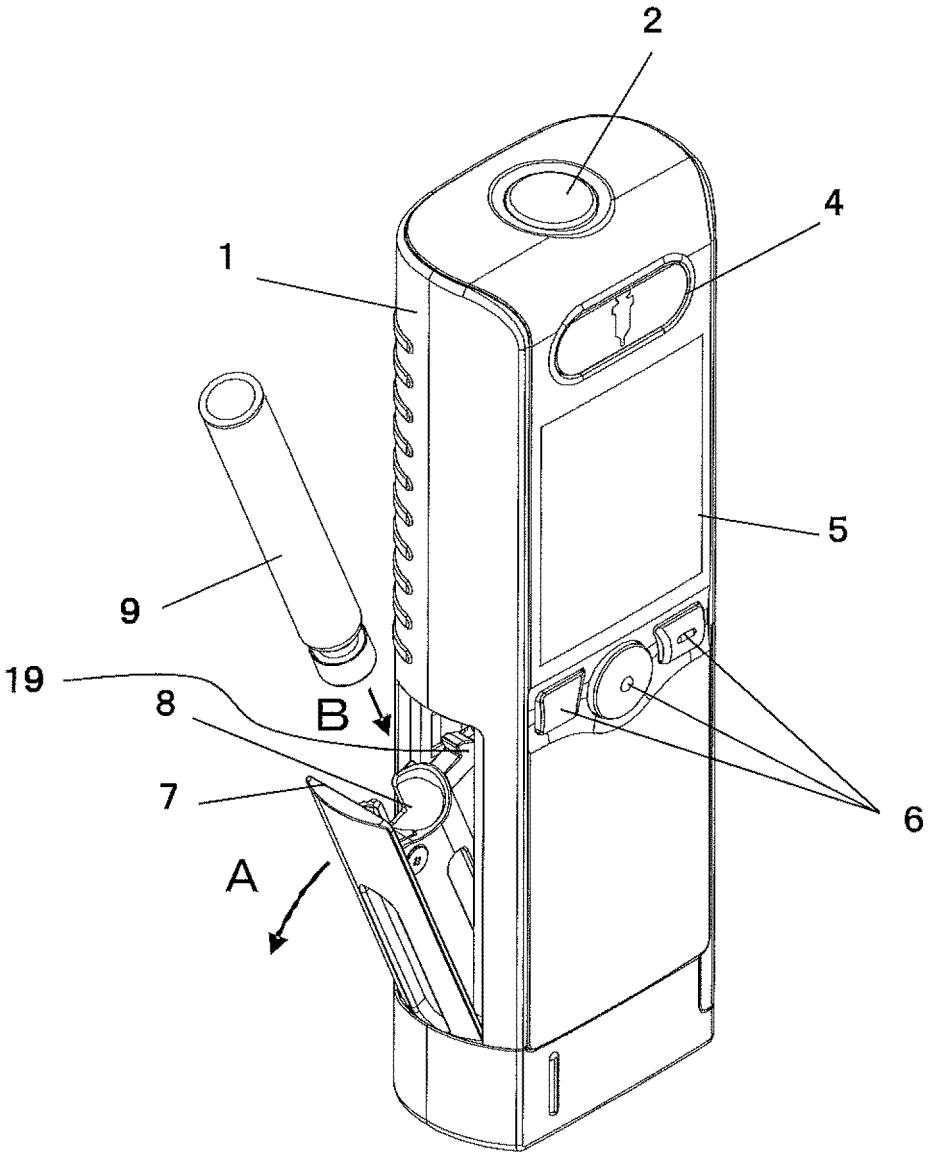


FIG. 3

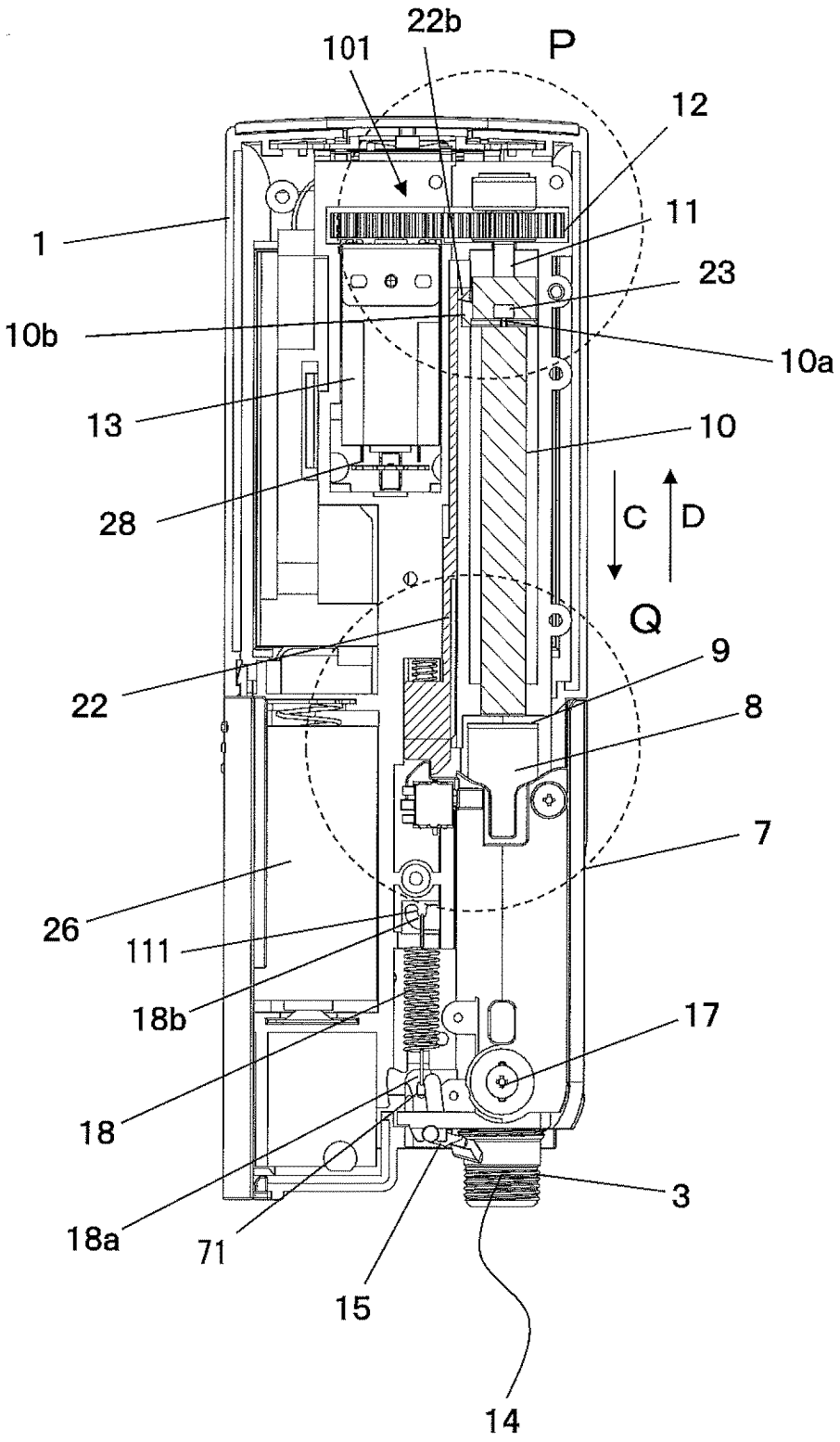
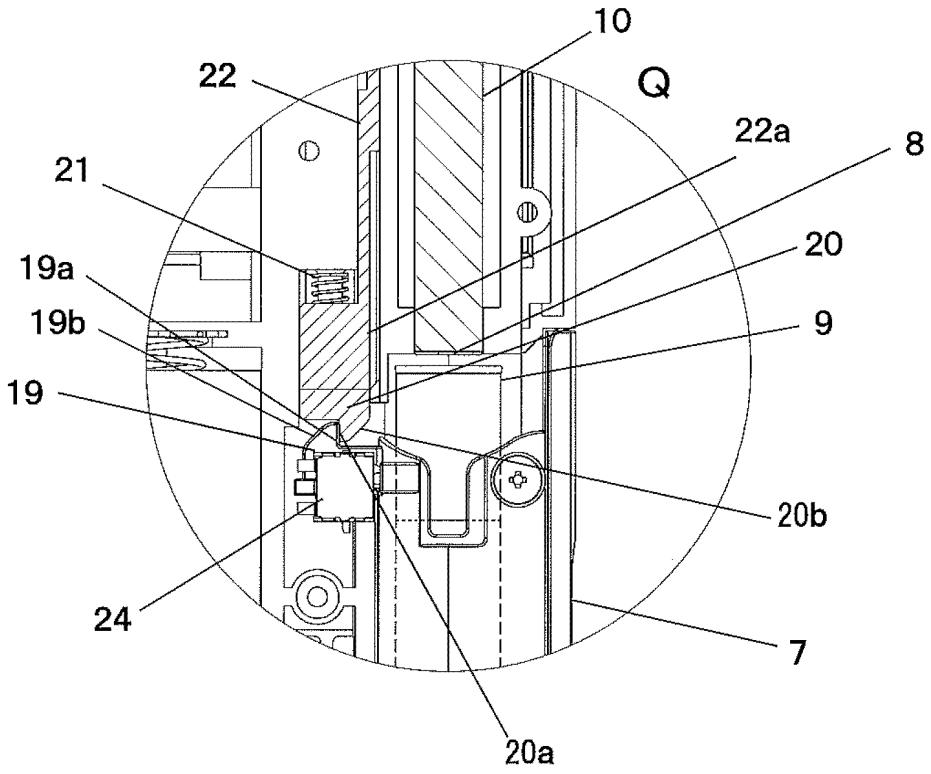

22b
101
P
12
11
1
23
10b
10a
13
10
28
C
D
Q
9
22
8
7
26
111
18b
17
18
3
18a
71
15
14

FIG. 4

(a)


10
22
Q
22a
8
21
20
19a
19b
9
19
20b
24
7
20a

(b)

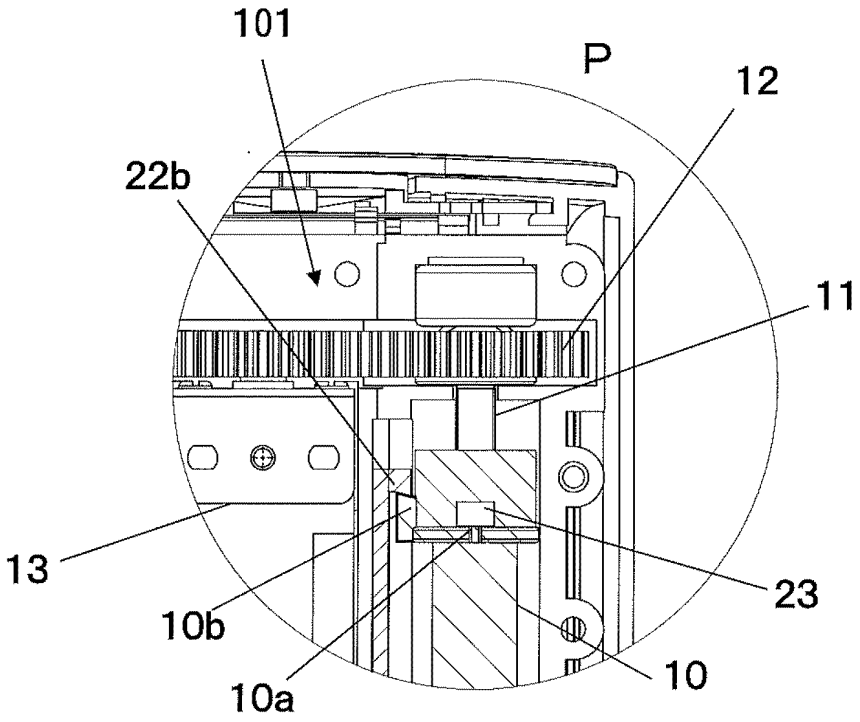

101
P
12
22b
11
13
23
10b
10
10a

FIG. 5

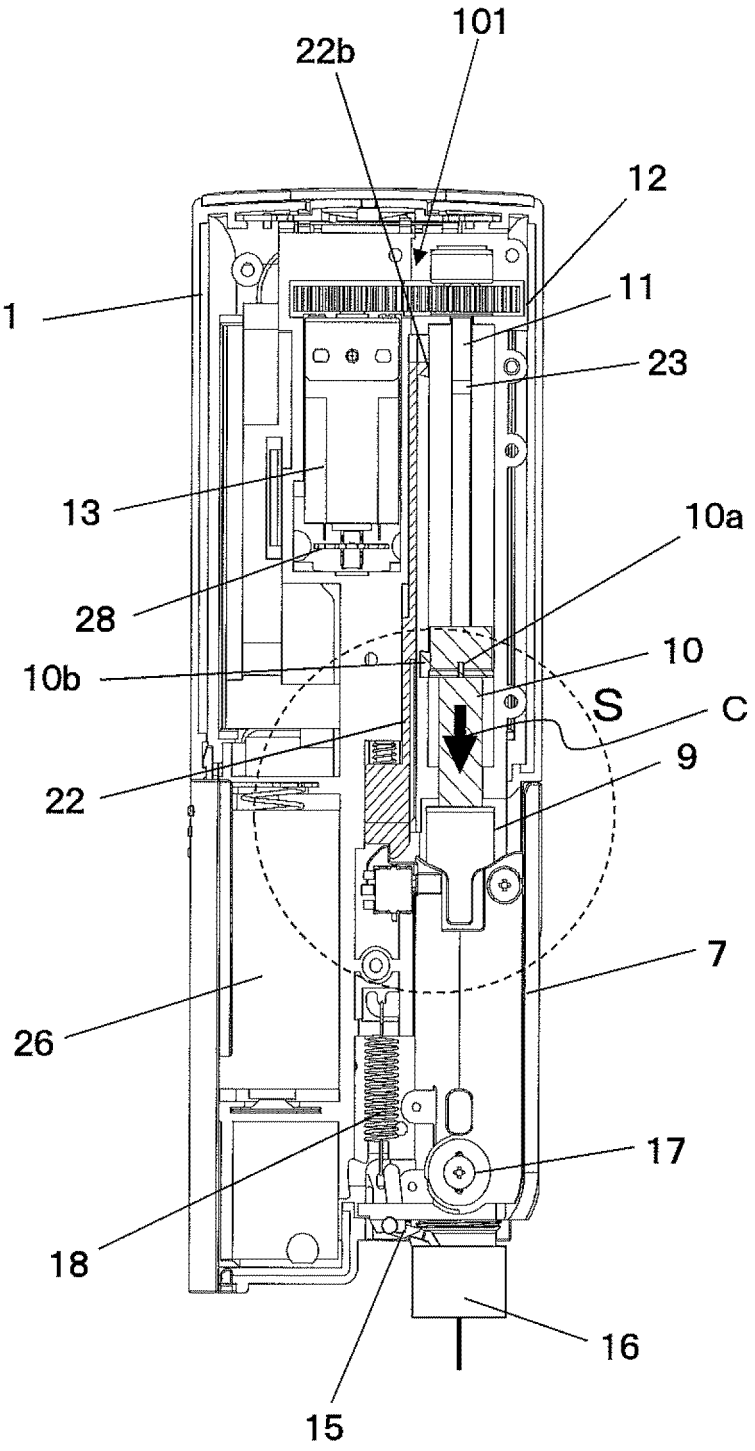


FIG. 6

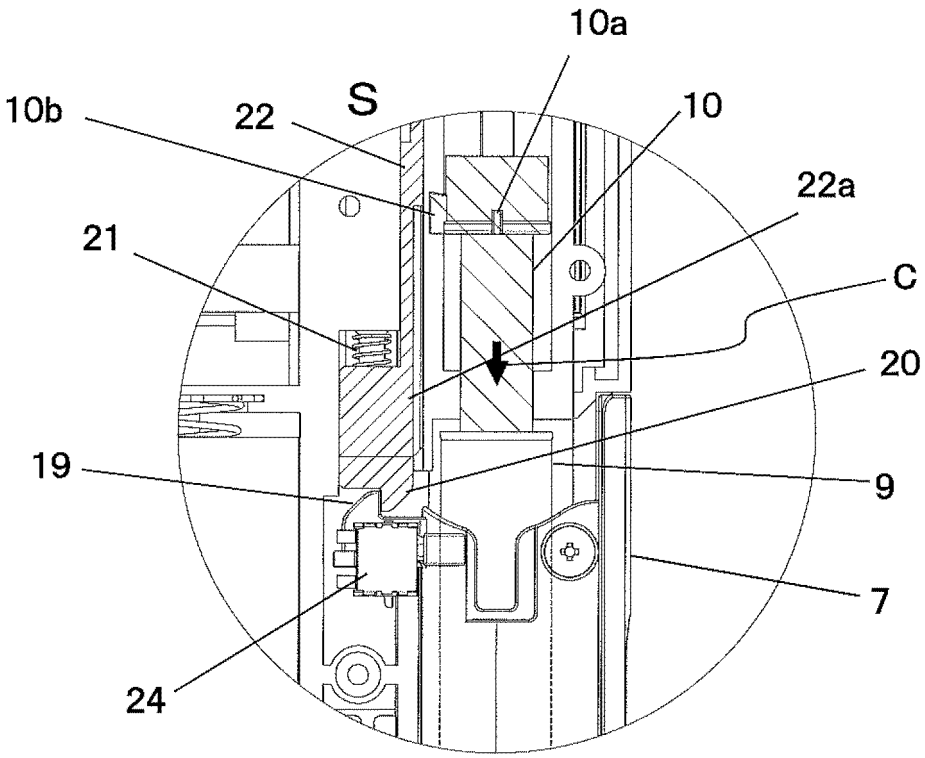


FIG. 7

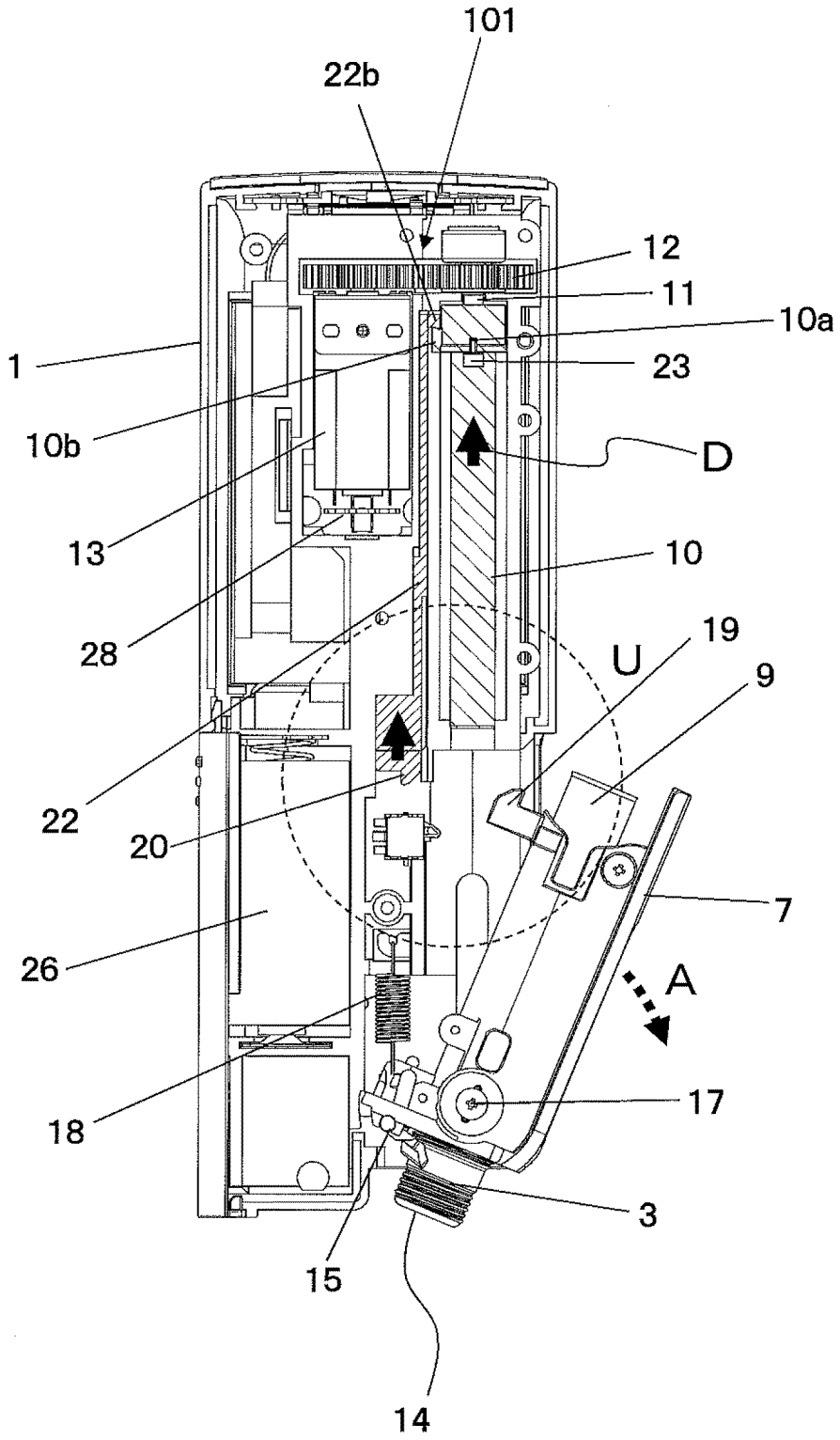


FIG. 8

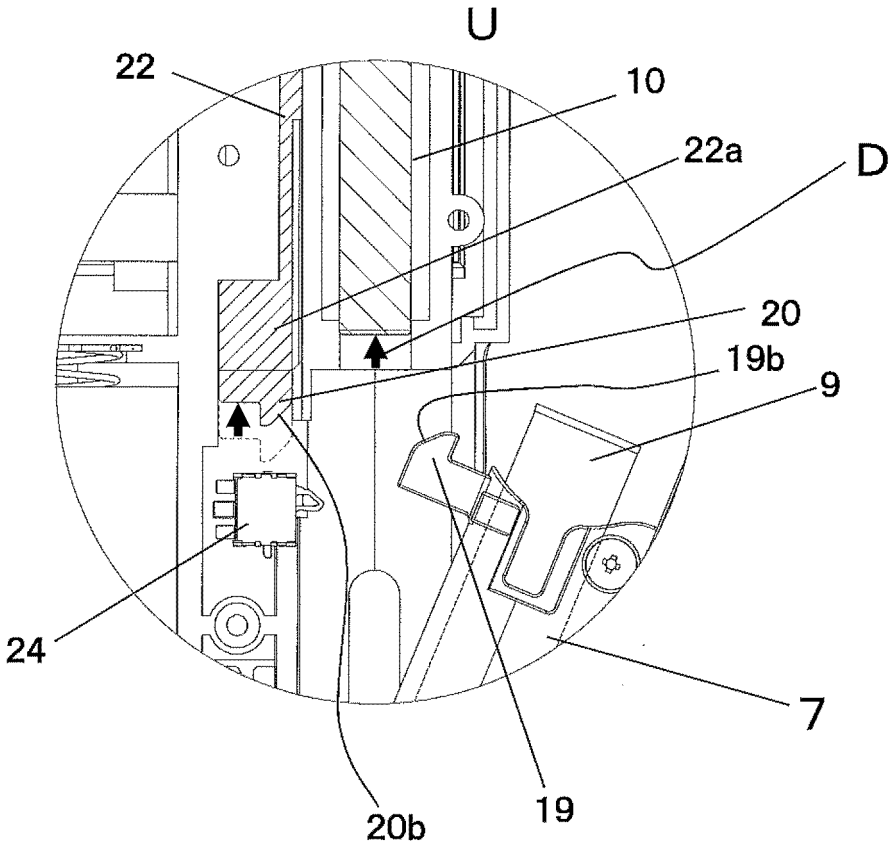


FIG. 9

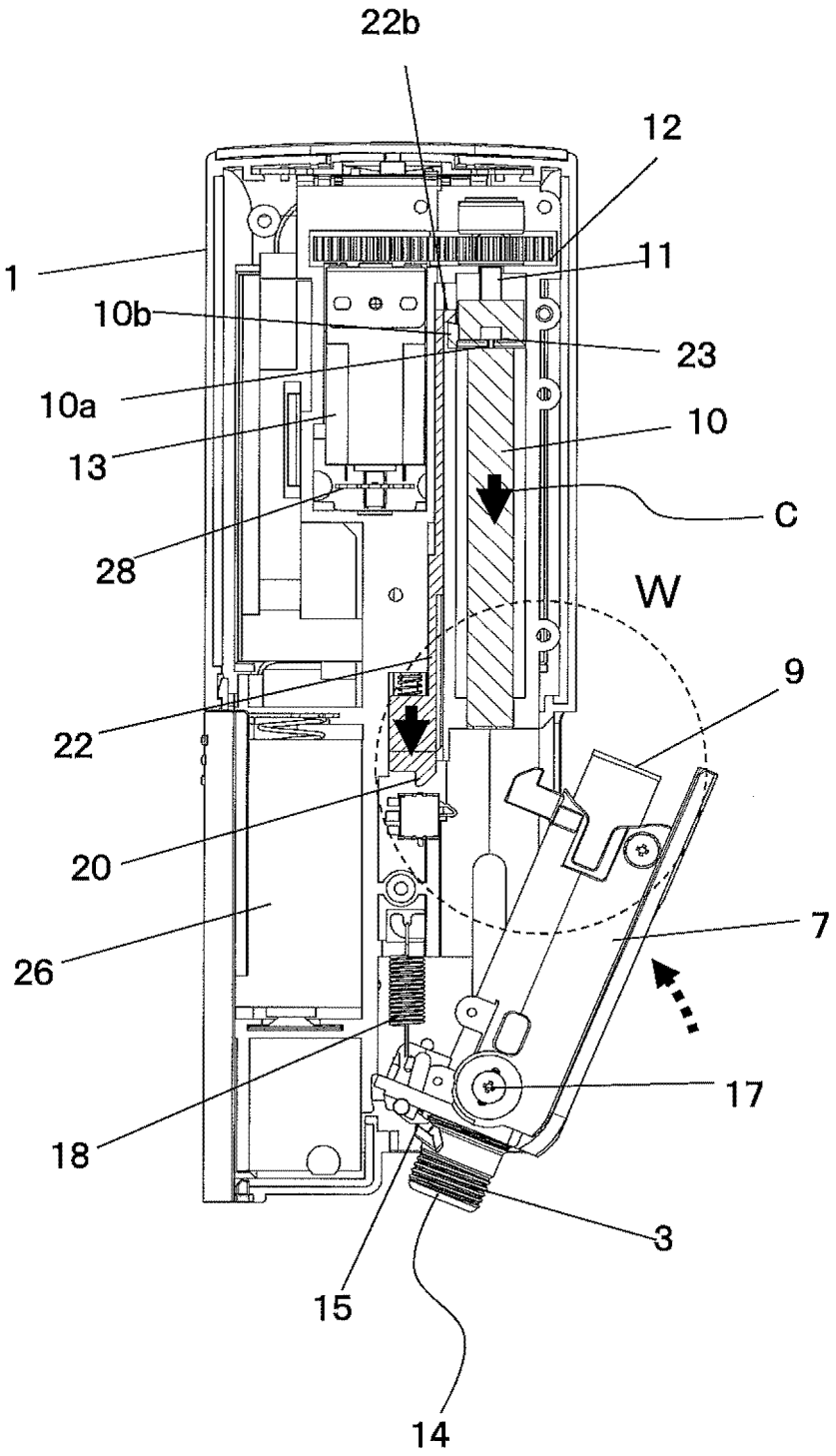


FIG. 10

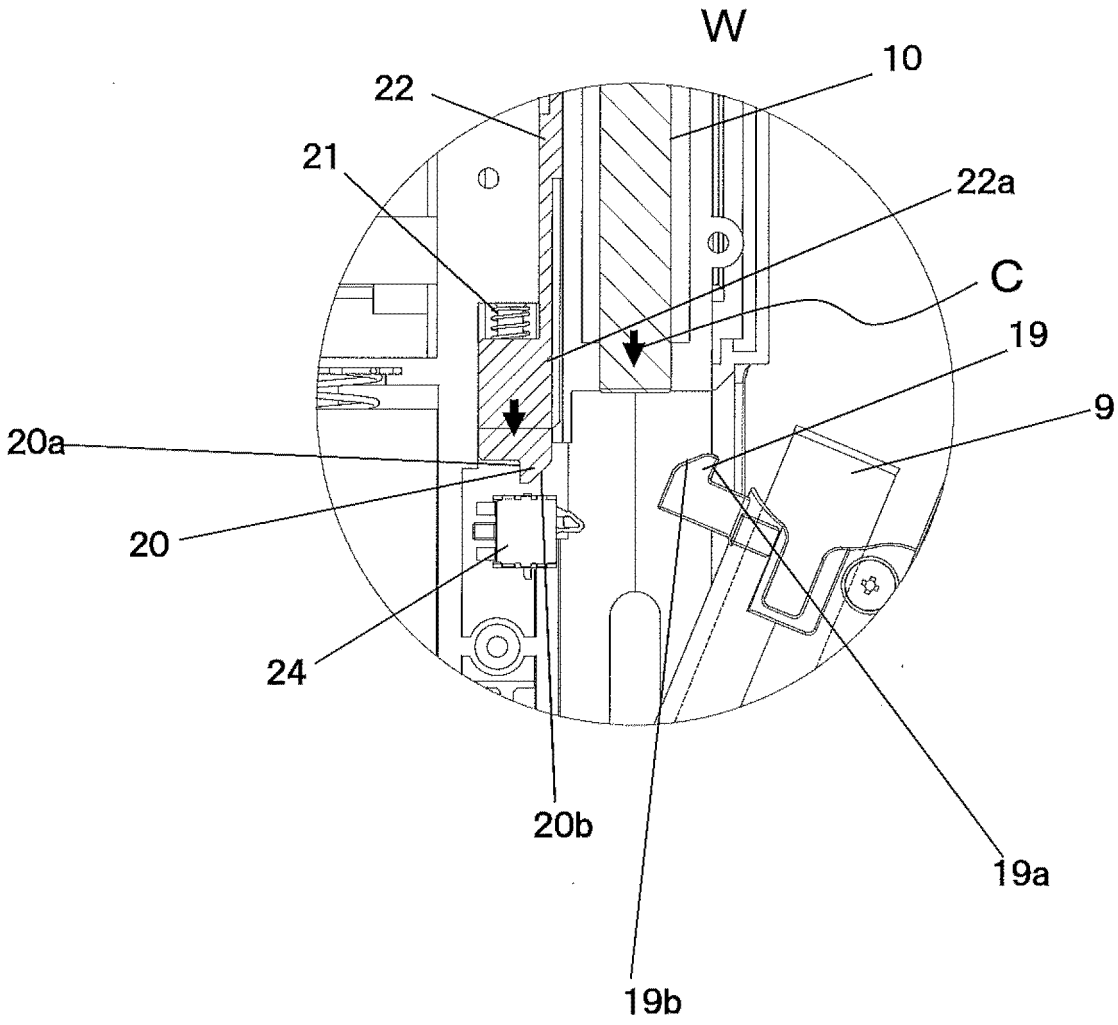


FIG. 11

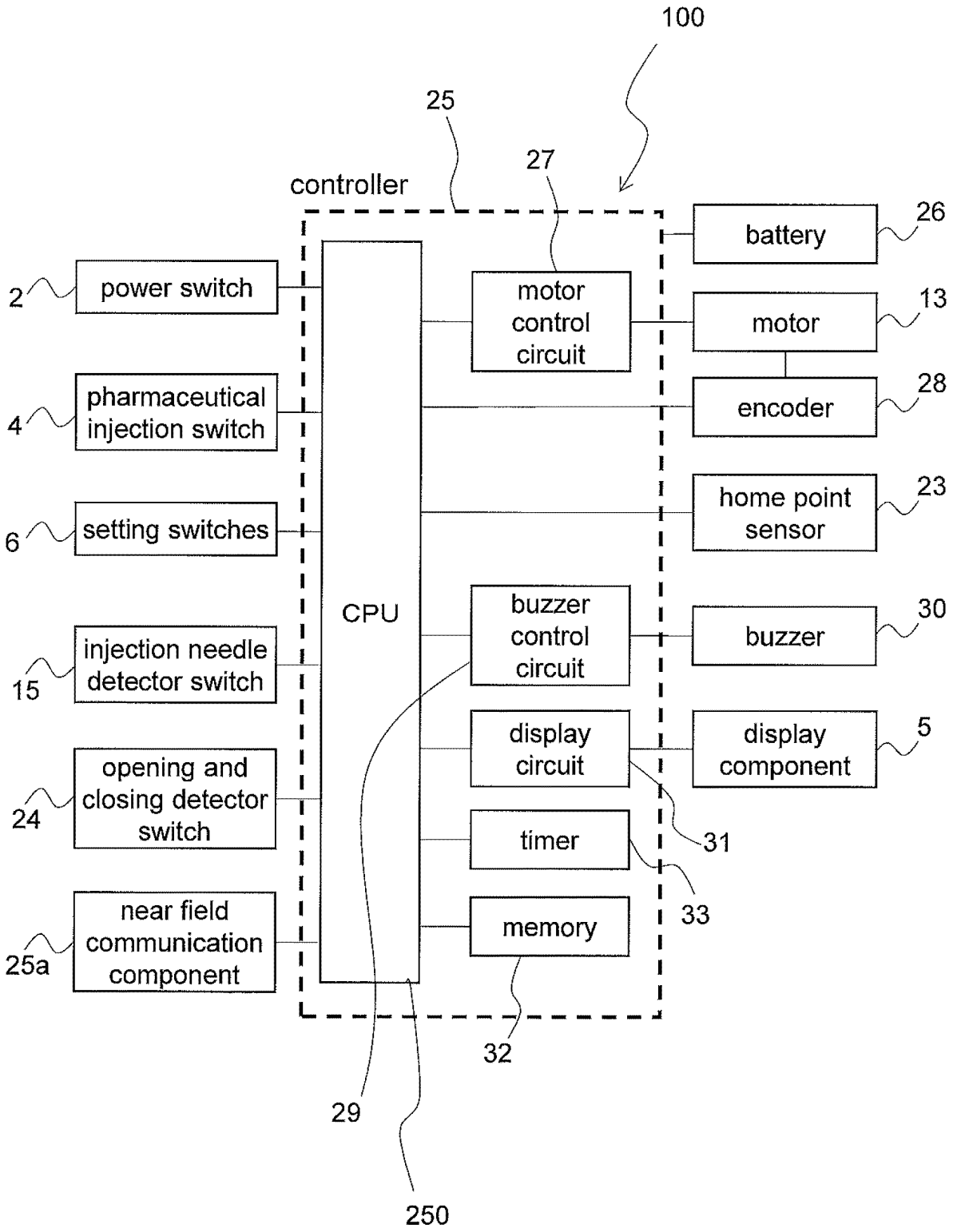

100
25
27
controller
battery
26
2
power switch
motor control circuit
motor
13
pharmaceutical injection switch
4
encoder
28
home point sensor
23
6
setting switches
CPU
buzzer control circuit
buzzer
30
injection needle detector switch
15
display circuit
display component
5
opening and closing detector switch
24
timer
31
33
near field communication component
25a
memory
32
29
250

FIG. 12

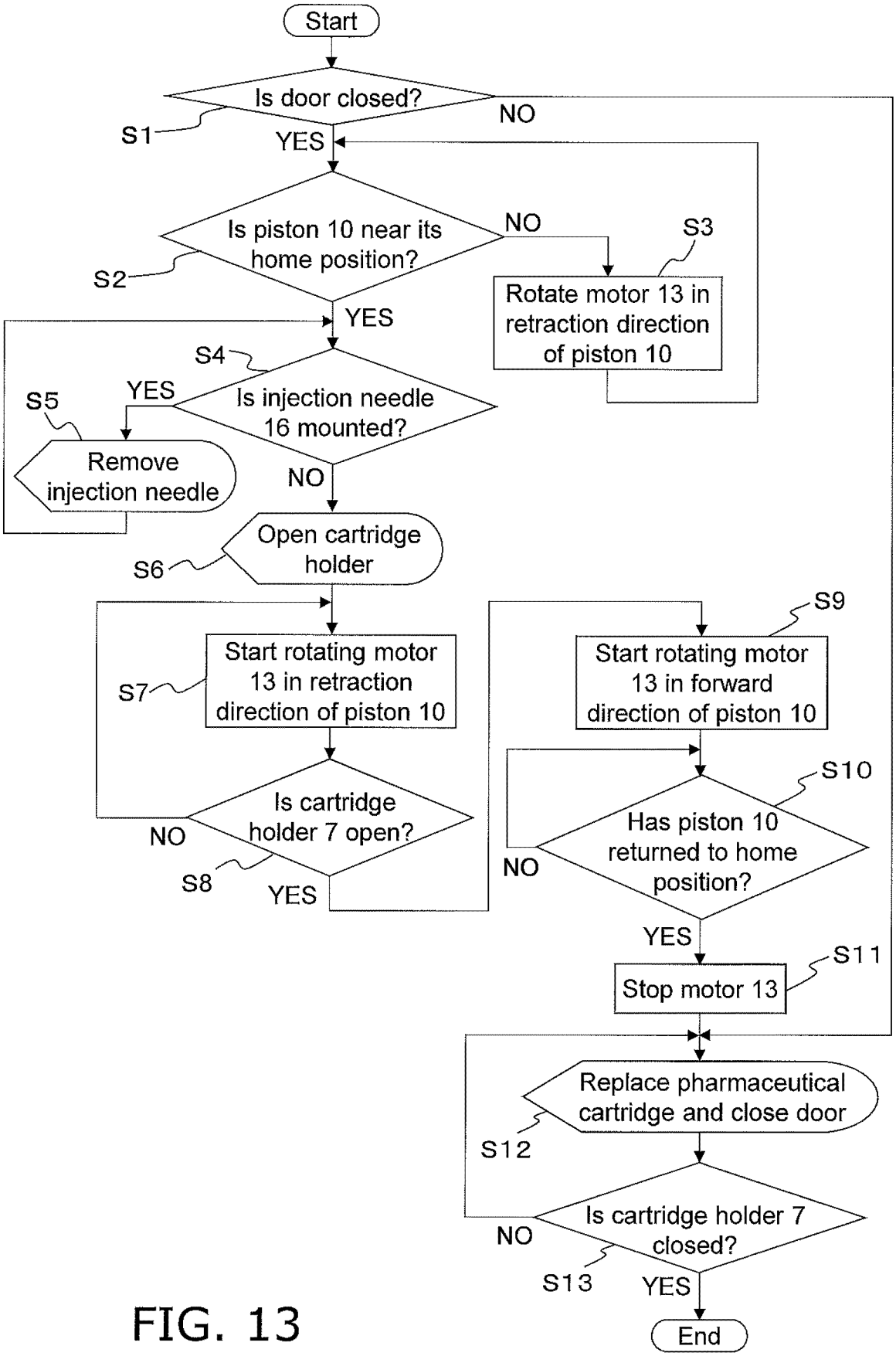

Start
Is door closed?
S1
NO
YES
Is piston 10 near its home position?
S2
NO
S3
Rotate motor 13 in retraction direction of piston 10
YES
S4
Is injection needle 16 mounted?
S5
YES
Remove injection needle
NO
Open cartridge holder
S6
Start rotating motor 13 in retraction direction of piston 10
S7
Is cartridge holder 7 open?
NO
S8
YES
S9
Start rotating motor 13 in forward direction of piston 10
S10
Has piston 10 returned to home position?
NO
YES
S11
Stop motor 13
Replace pharmaceutical cartridge and close door
S12
Is cartridge holder 7 closed?
NO
S13
YES
End

FIG. 13

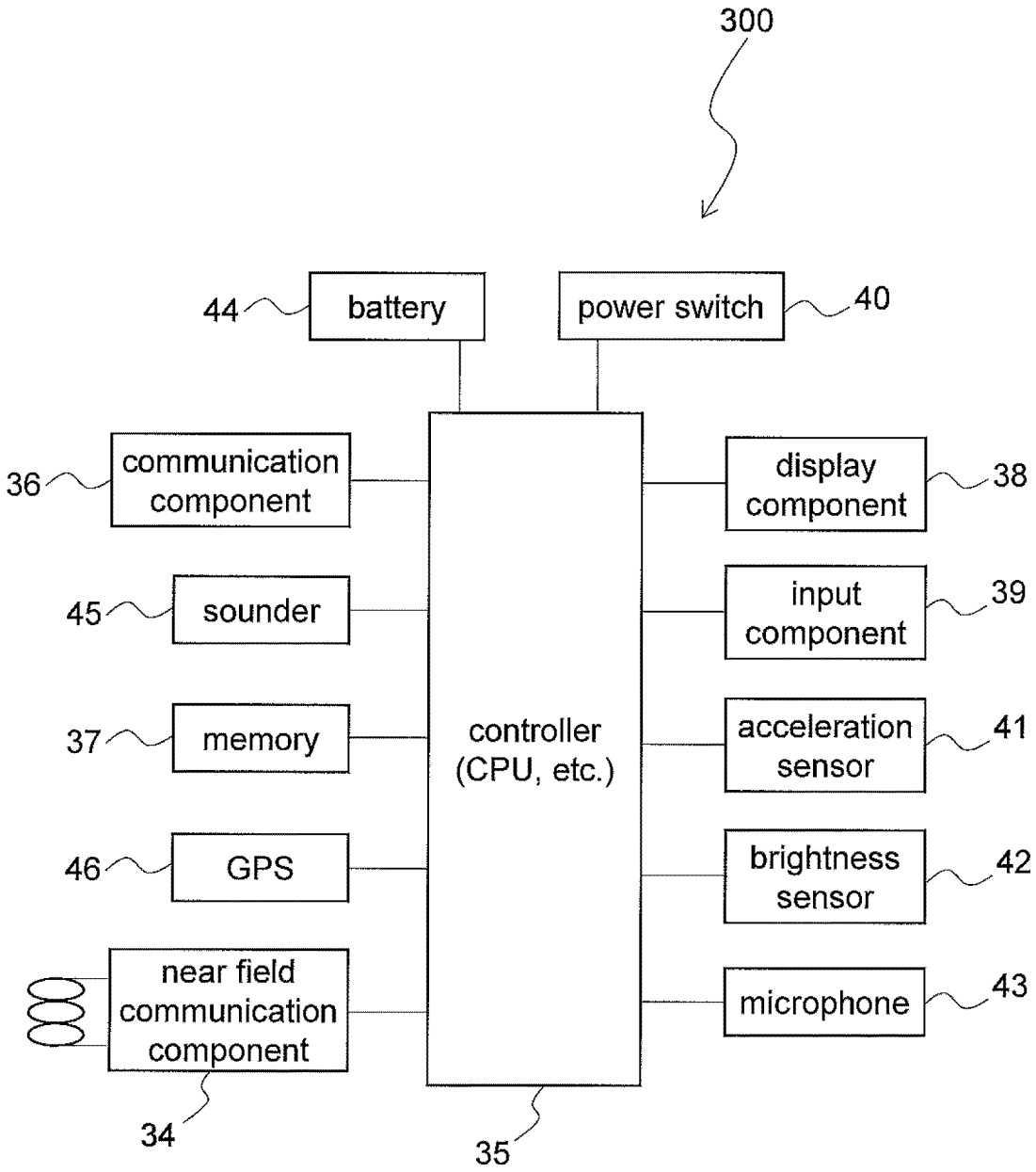

300
44
battery
power switch
40
36
communication component
display component
38
45
sounder
input component
39
37
memory
controller (CPU, etc.)
acceleration sensor
41
46
GPS
brightness sensor
42
near field communication component
microphone
43
34
35

FIG. 14

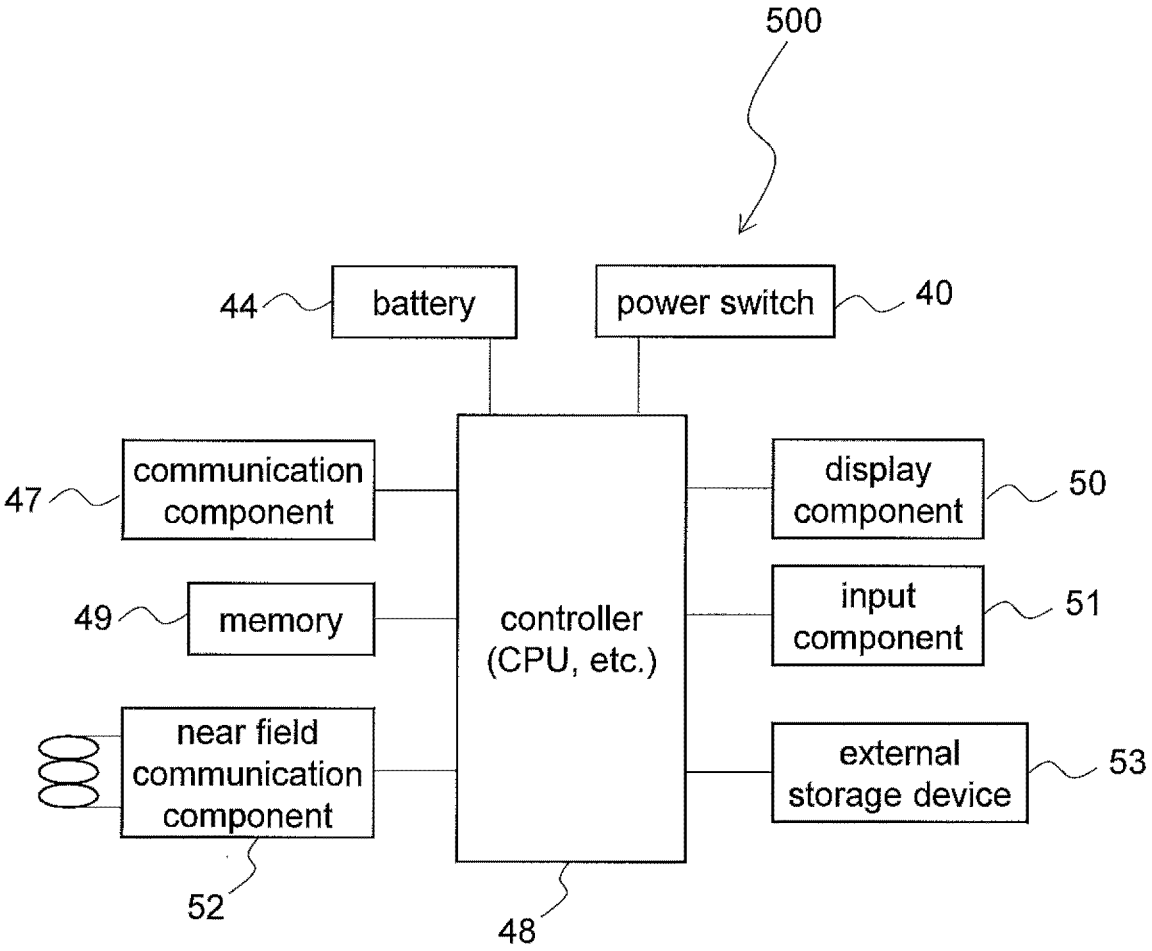
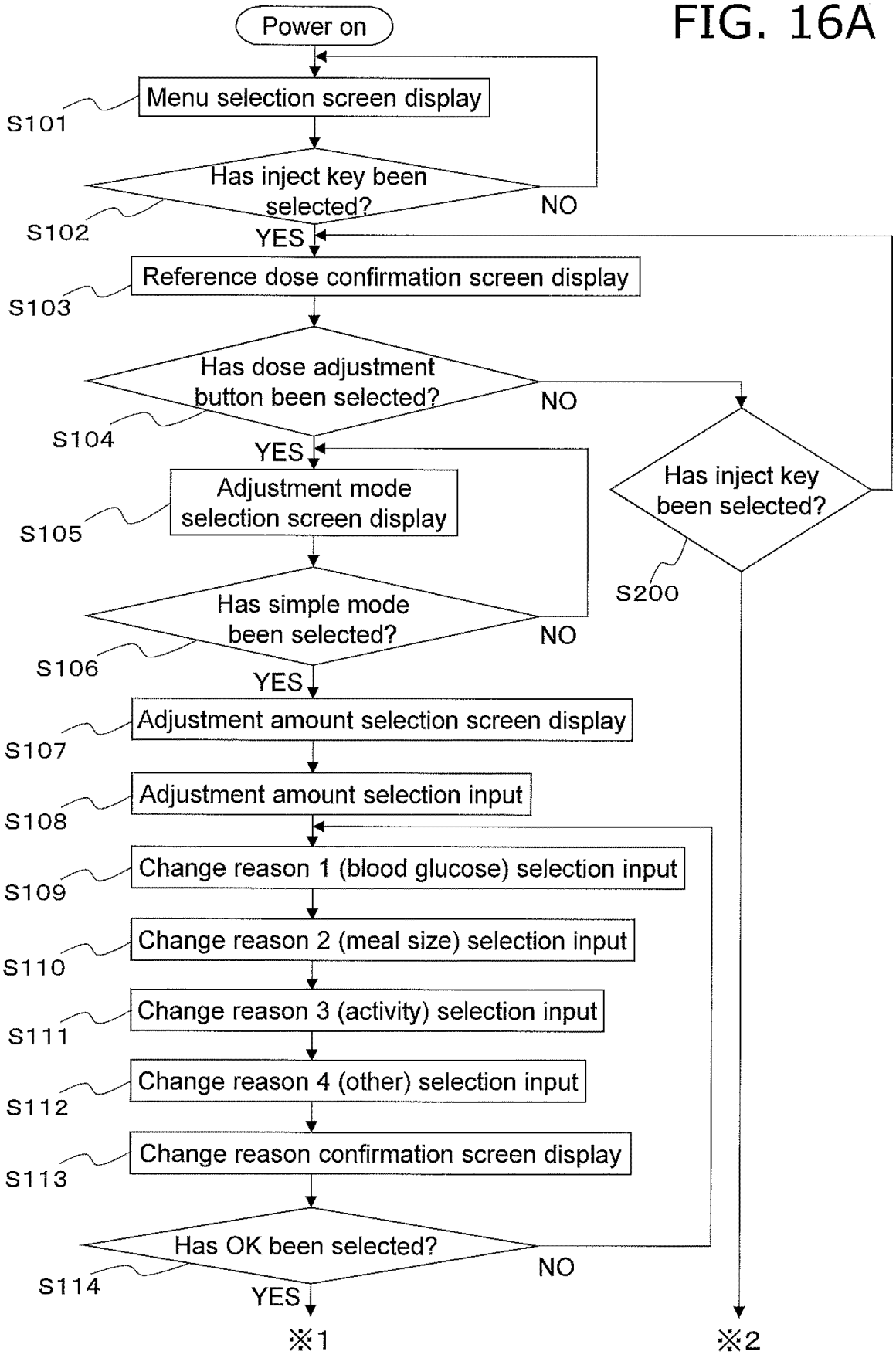

500
44
battery
power switch
40
47
communication component
display component
50
49
memory
controller (CPU, etc.)
input component
51
near field communication component
external storage device
53
52
48

FIG. 15

FIG. 16A


Power on
Menu selection screen display
S101
Has inject key been selected?
NO
S102
YES
Reference dose confirmation screen display
S103
Has dose adjustment button been selected?
NO
S104
YES
Adjustment mode selection screen display
S105
Has simple mode been selected?
NO
S106
YES
Adjustment amount selection screen display
S107
Adjustment amount selection input
S108
Change reason 1 (blood glucose) selection input
S109
Change reason 2 (meal size) selection input
S110
Change reason 3 (activity) selection input
S111
Change reason 4 (other) selection input
S112
Change reason confirmation screen display
S113
Has OK been selected?
NO
S114
YES
※1
Has inject key been selected?
S200
※2

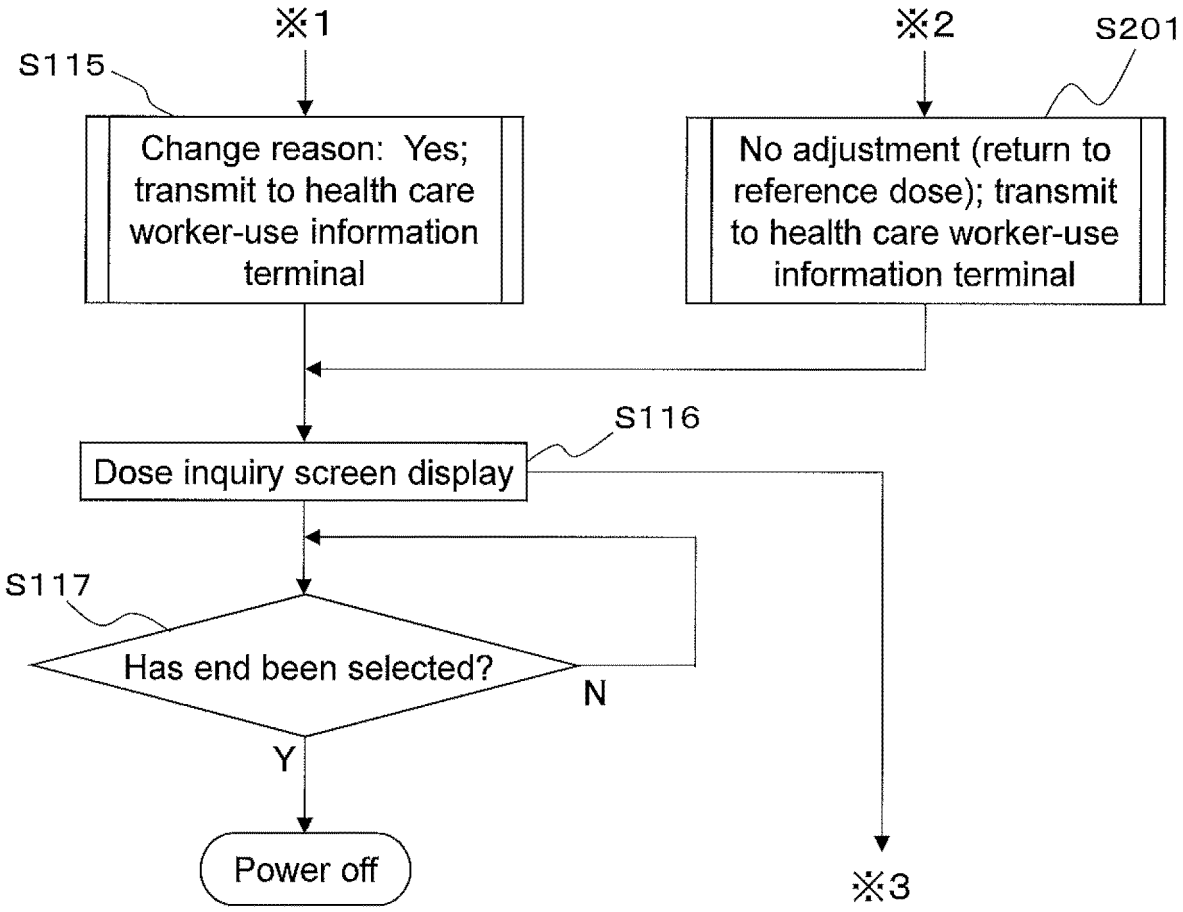

※1
※2
S201
S115
Change reason: Yes; transmit to health care worker-use information terminal
No adjustment (return to reference dose); transmit to health care worker-use information terminal
S116
Dose inquiry screen display
S117
Has end been selected?
N
Y
Power off
※3

FIG. 16B

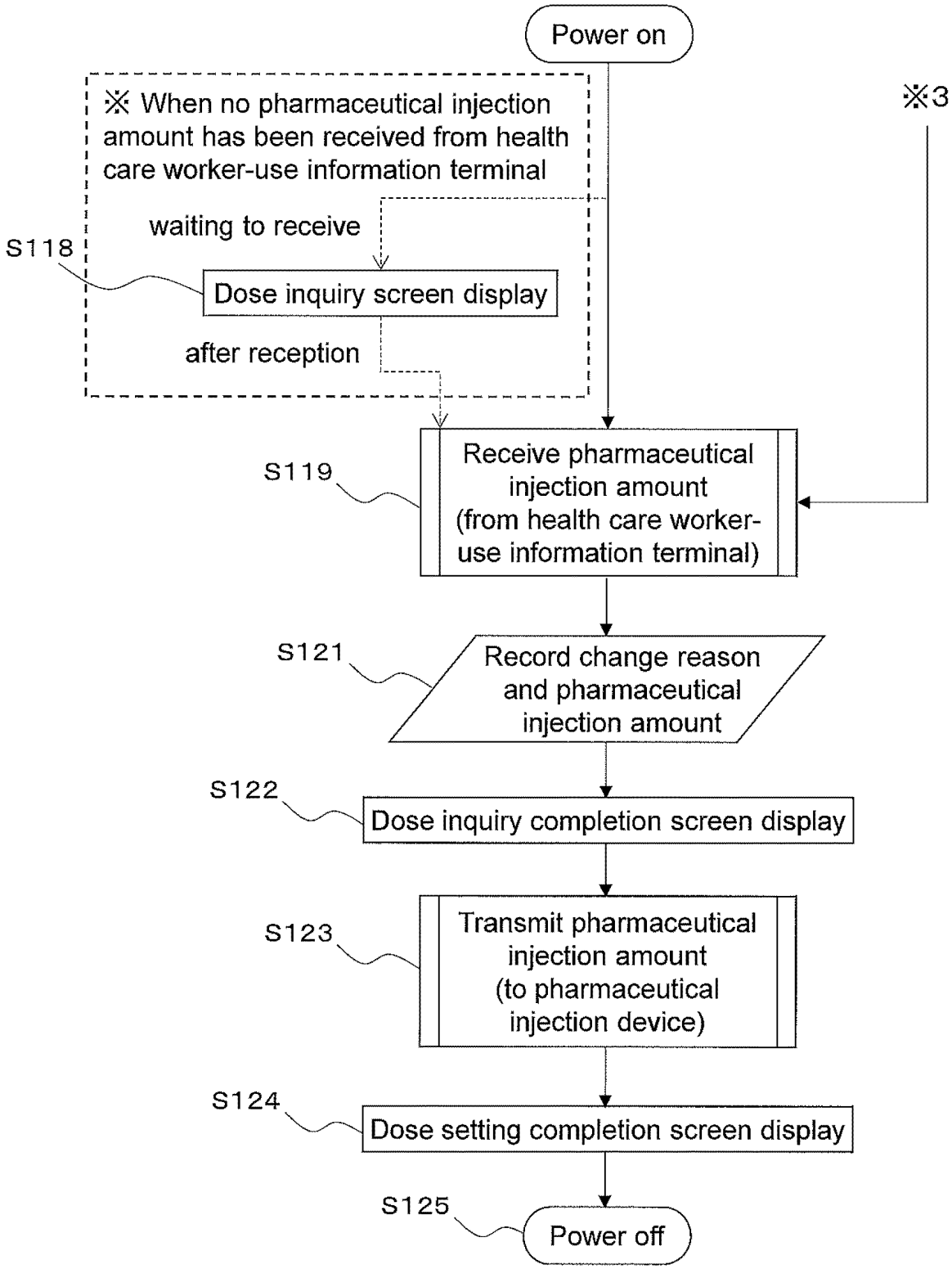

Power on
※ When no pharmaceutical injection amount has been received from health care worker-use information terminal
waiting to receive
S118
Dose inquiry screen display
after reception
※3
S119
Receive pharmaceutical injection amount (from health care worker-use information terminal)
S121
Record change reason and pharmaceutical injection amount
S122
Dose inquiry completion screen display
S123
Transmit pharmaceutical injection amount (to pharmaceutical injection device)
S124
Dose setting completion screen display
S125
Power off

FIG. 16C

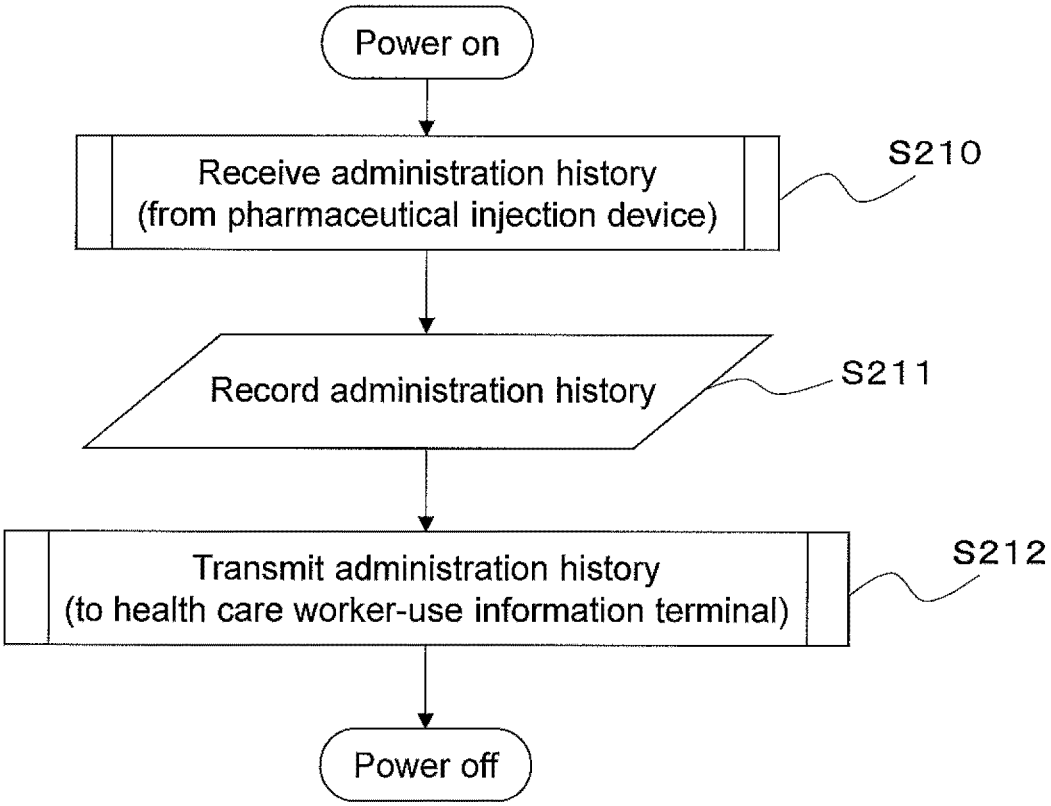

Power on
Receive administration history
(from pharmaceutical injection device)
S210
Record administration history
S211
Transmit administration history
(to health care worker-use information terminal)
S212
Power off

FIG. 16D

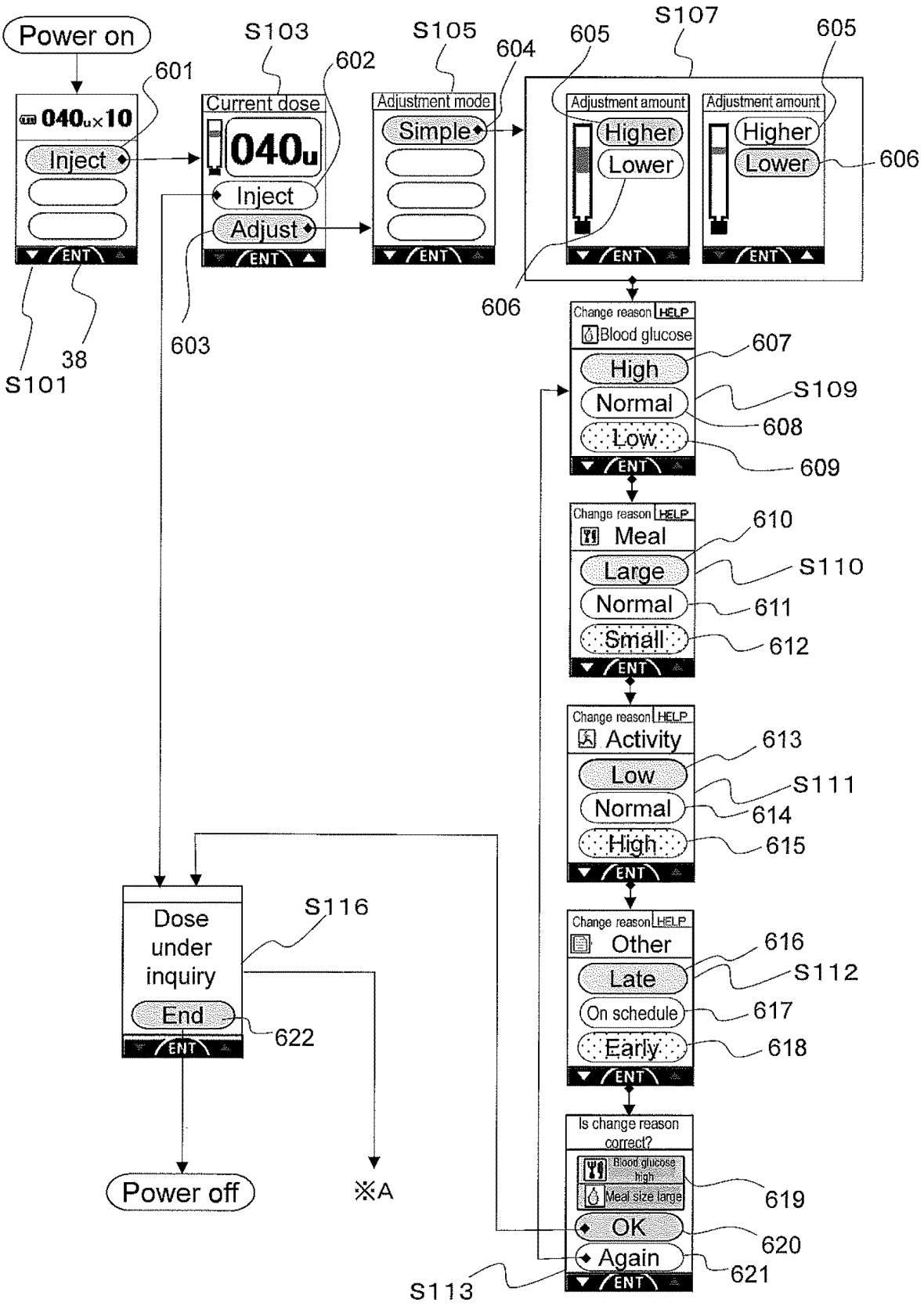

Power on
S101
38
601
040u×10
Inject
S103
602
Current dose
040u
Inject
Adjust
603
S105
604
Adjustment mode
Simple
S107
605
Adjustment amount
Higher
Lower
606
Change reason HELP
Blood glucose
607
High
Normal
S109
608
Low
609
Meal
610
Large
S110
Normal
611
Small
612
Activity
613
Low
S111
Normal
614
High
615
Other
616
Late
S112
On schedule
617
Early
618
Is change reason correct?
Blood glucose high
Meal size large
619
OK
620
Again
621
S113
Dose under inquiry
S116
End
622
Power off
※A

FIG. 17A

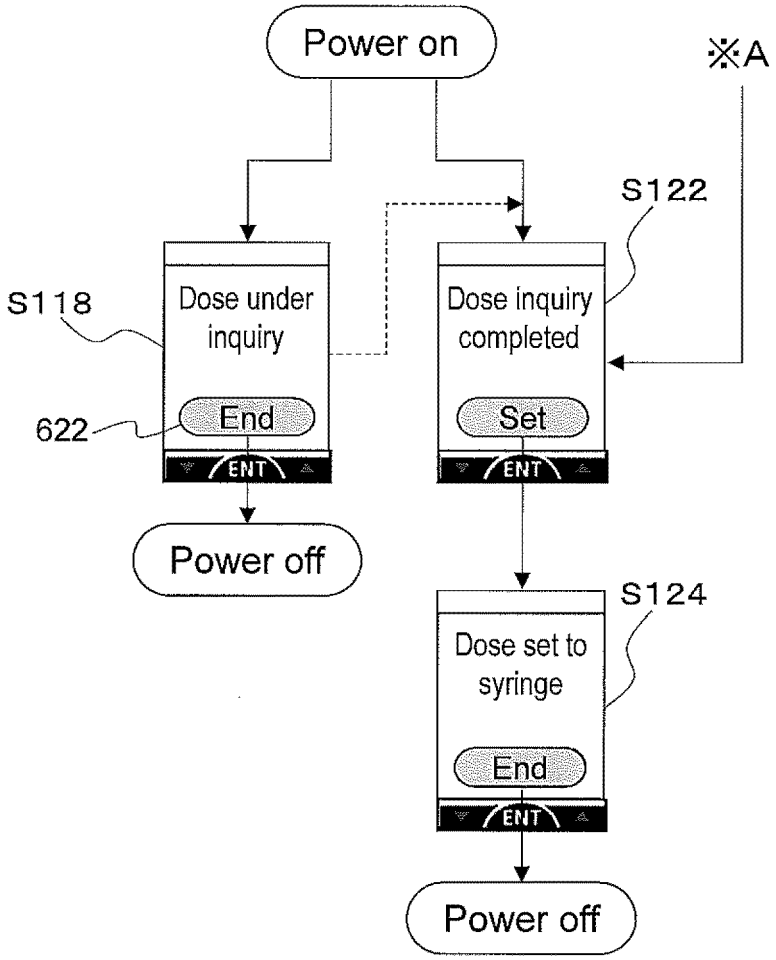

Power on
※A
S122
S118
Dose under inquiry
Dose inquiry completed
622
End
Set
ENT
ENT
Power off
S124
Dose set to syringe
End
ENT
Power off

FIG. 17B

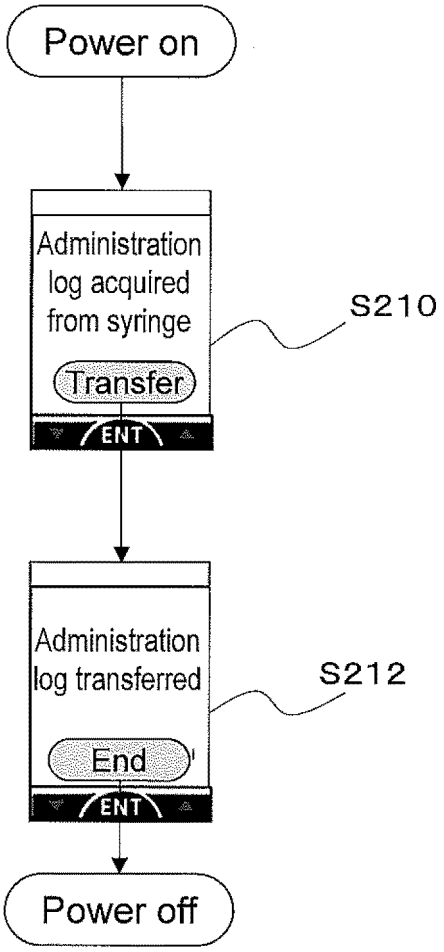

Power on
Administration log acquired from syringe
Transfer
ENT
S210
Administration log transferred
End
ENT
S212
Power off

FIG. 17C

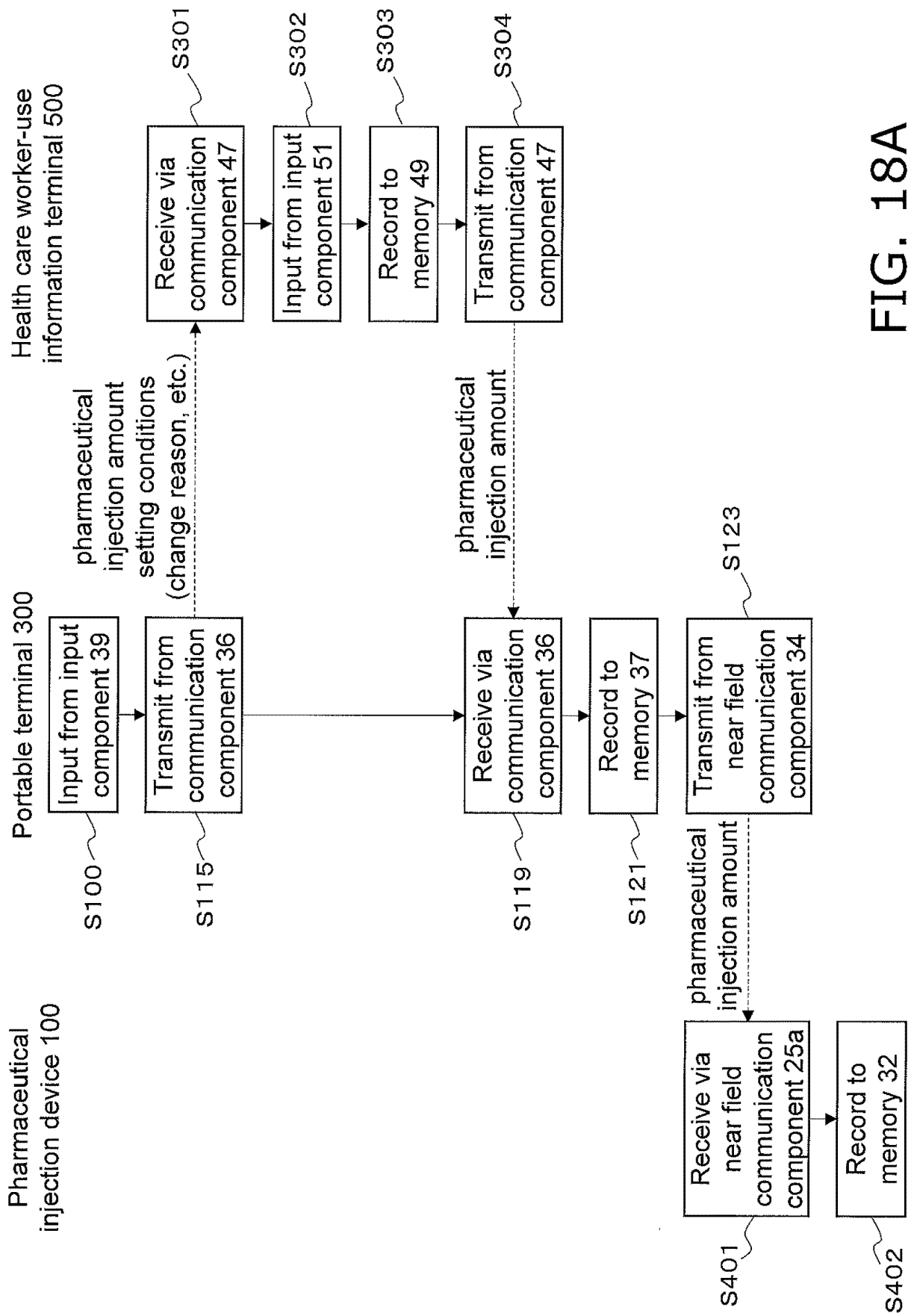

Pharmaceutical injection device 100
Portable terminal 300
Health care worker-use information terminal 500
Input from input component 39
Transmit from communication component 36
pharmaceutical injection amount setting conditions (change reason, etc.)
Receive via communication component 47
Input from input component 51
Record to memory 49
Transmit from communication component 47
pharmaceutical injection amount
Receive via communication component 36
Record to memory 37
Transmit from near field communication component 34
pharmaceutical injection amount
Receive via near field communication component 25a
Record to memory 32
S100
S115
S119
S121
S123
S301
S302
S303
S304
S401
S402

FIG. 18A

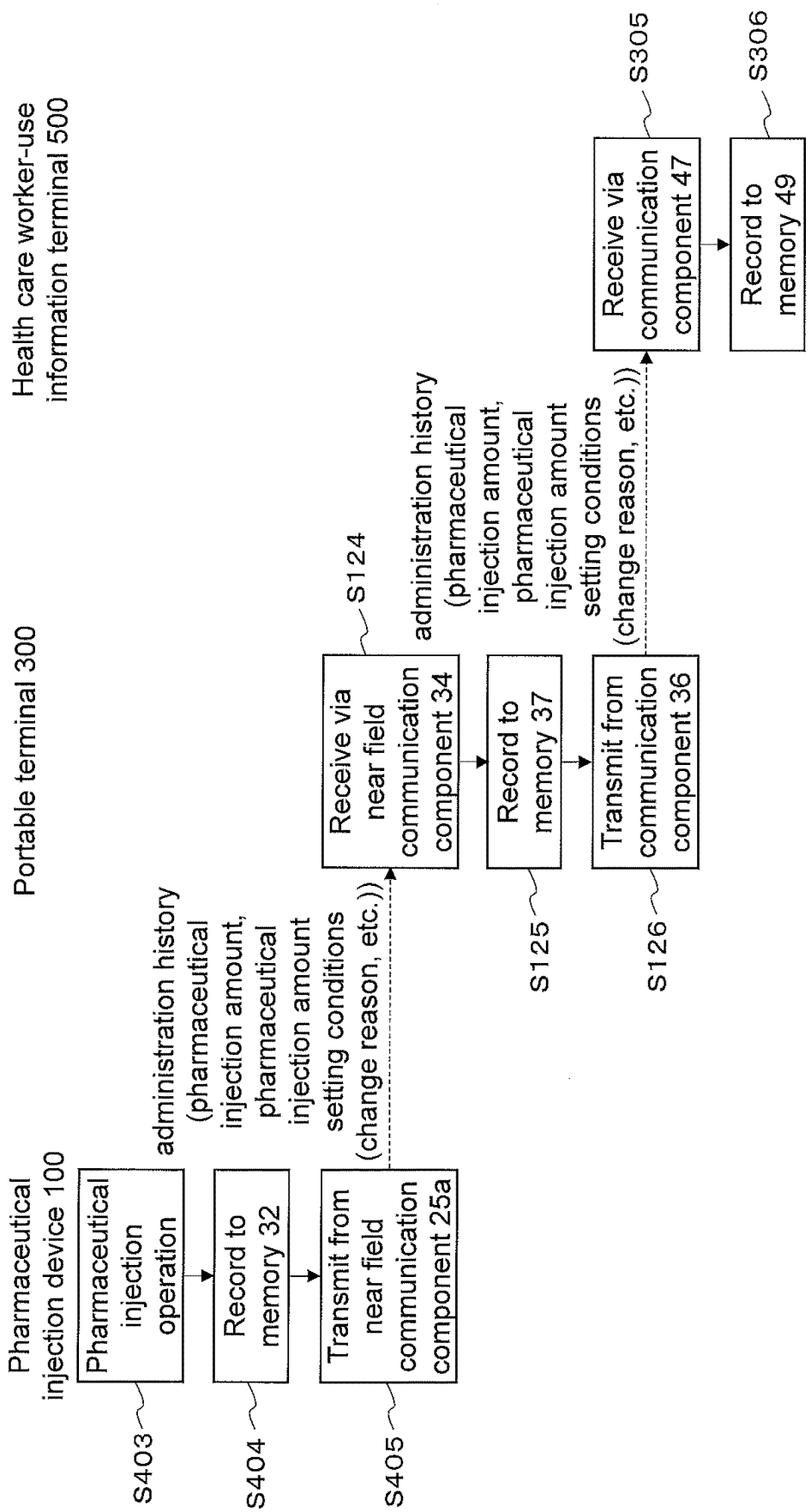

Pharmaceutical injection device 100
Portable terminal 300
Health care worker-use information terminal 500
Pharmaceutical injection operation
S403
Record to memory 32
S404
Transmit from near field communication component 25a
S405
administration history (pharmaceutical injection amount, pharmaceutical injection amount setting conditions (change reason, etc.))
Receive via near field communication component 34
S124
Record to memory 37
S125
Transmit from communication component 36
S126
administration history (pharmaceutical injection amount, pharmaceutical injection amount setting conditions (change reason, etc.))
Receive via communication component 47
S305
Record to memory 49
S306

FIG. 18B

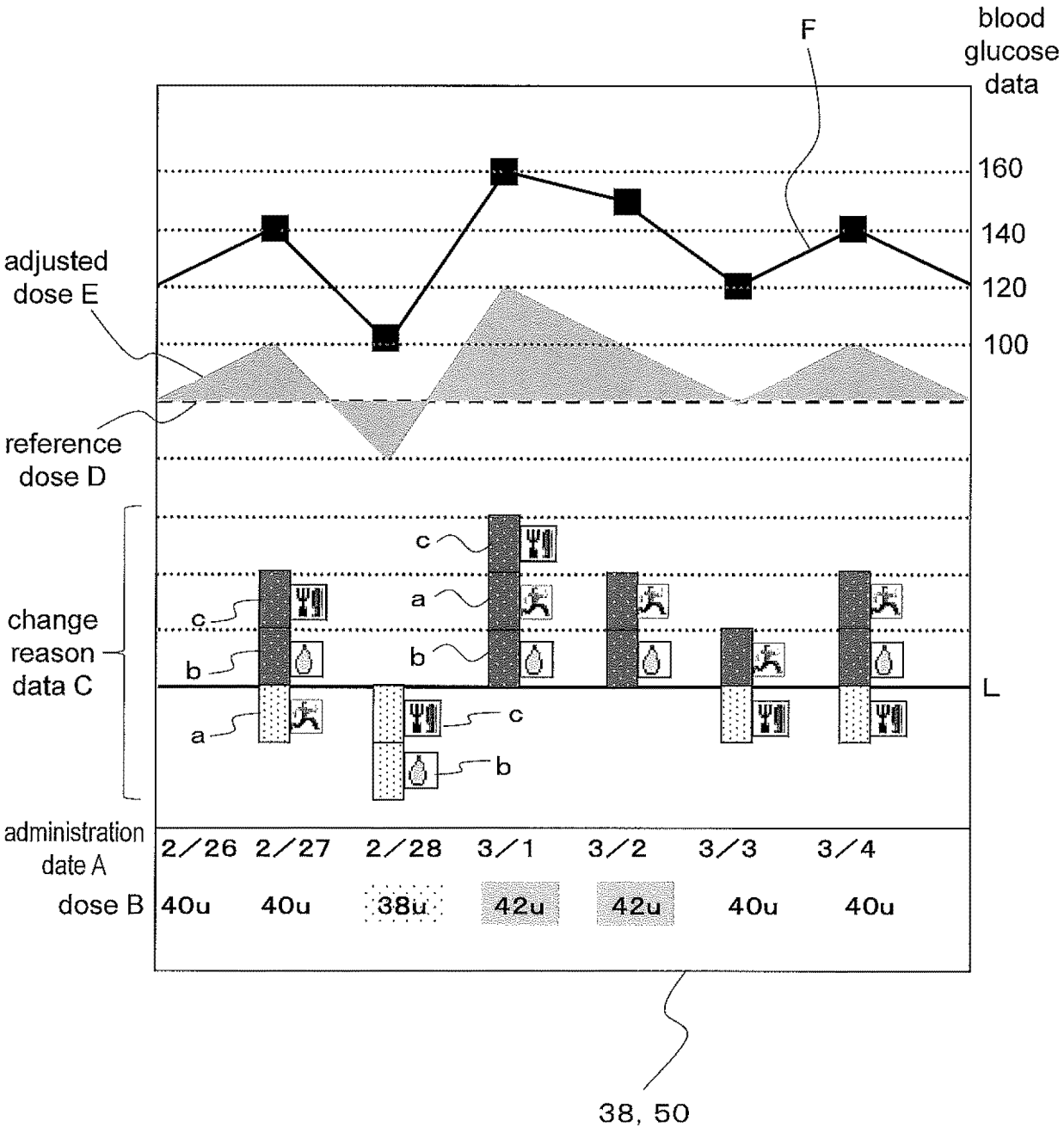

blood glucose data
F
160
140
120
100
adjusted dose E
reference dose D
change reason data C
c
a
b
L
administration date A
2/26
2/27
2/28
3/1
3/2
3/3
3/4
dose B
40u
40u
38u
42u
42u
40u
40u
38, 50

FIG. 19

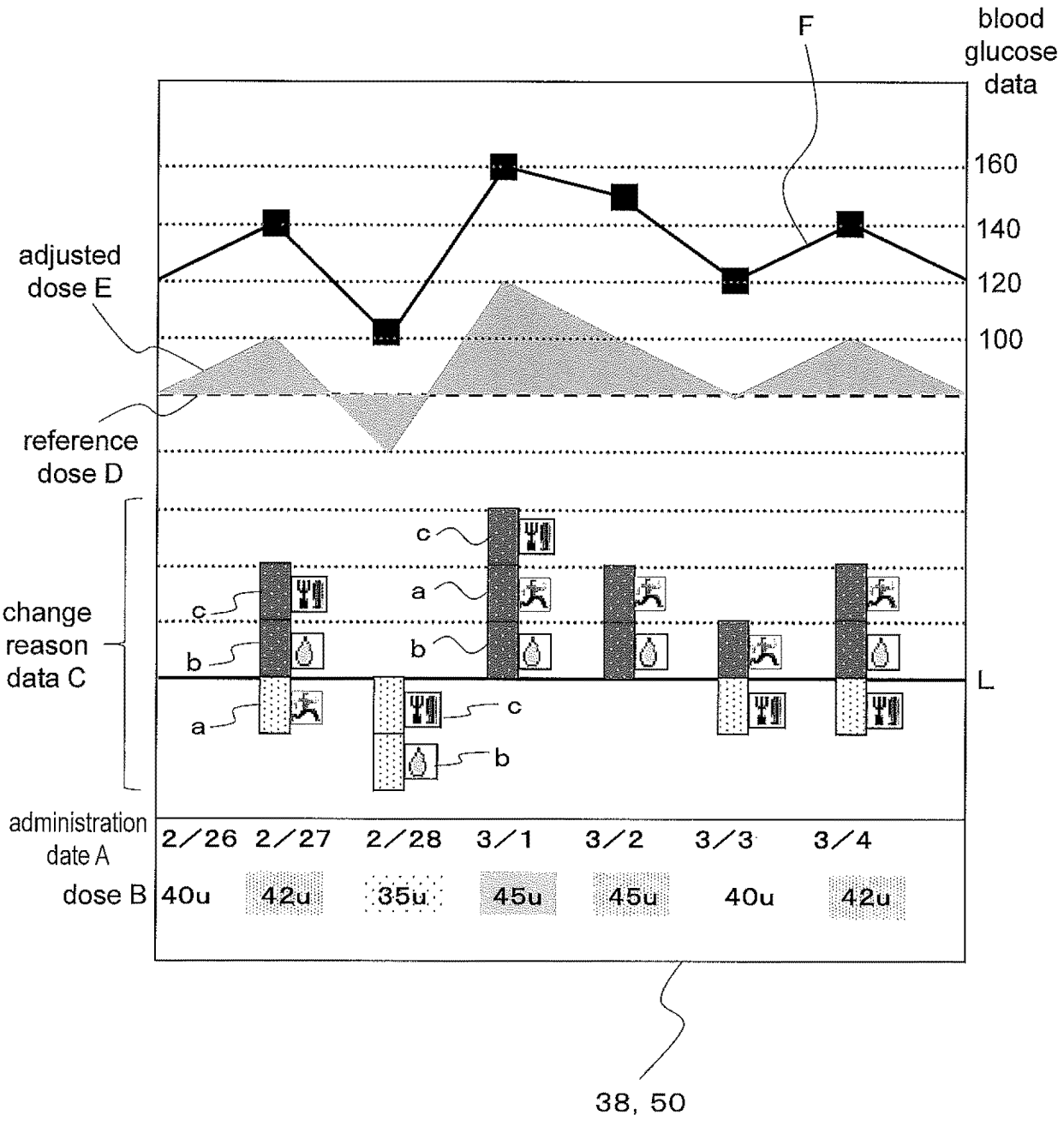

F
blood glucose data
160
140
120
100
adjusted dose E
reference dose D
change reason data C
c
a
b
L
administration date A
2/26
2/27
2/28
3/1
3/2
3/3
3/4
dose B
40u
42u
35u
45u
45u
40u
42u
38, 50

FIG. 20

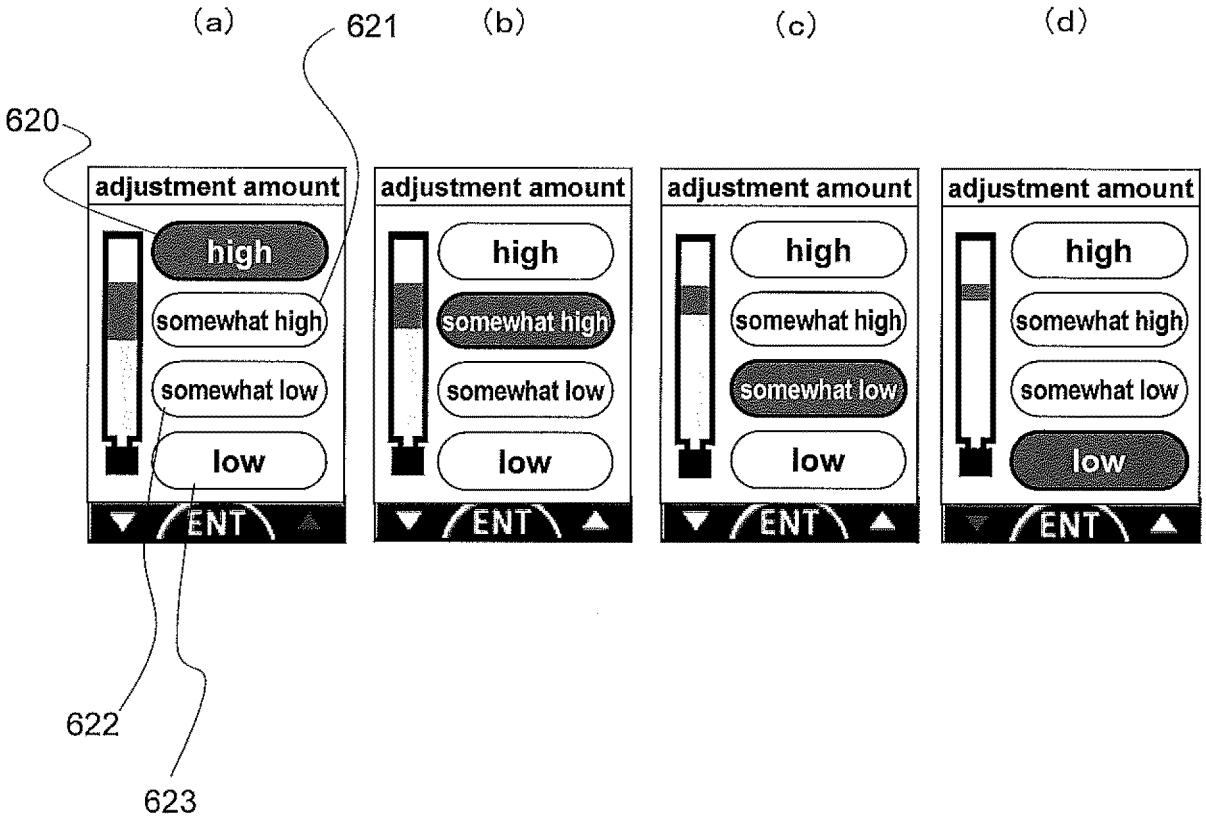

(a)
621
(b)
(c)
(d)
620
adjustment amount
high
somewhat high
somewhat low
low
ENT
622
623

FIG. 21

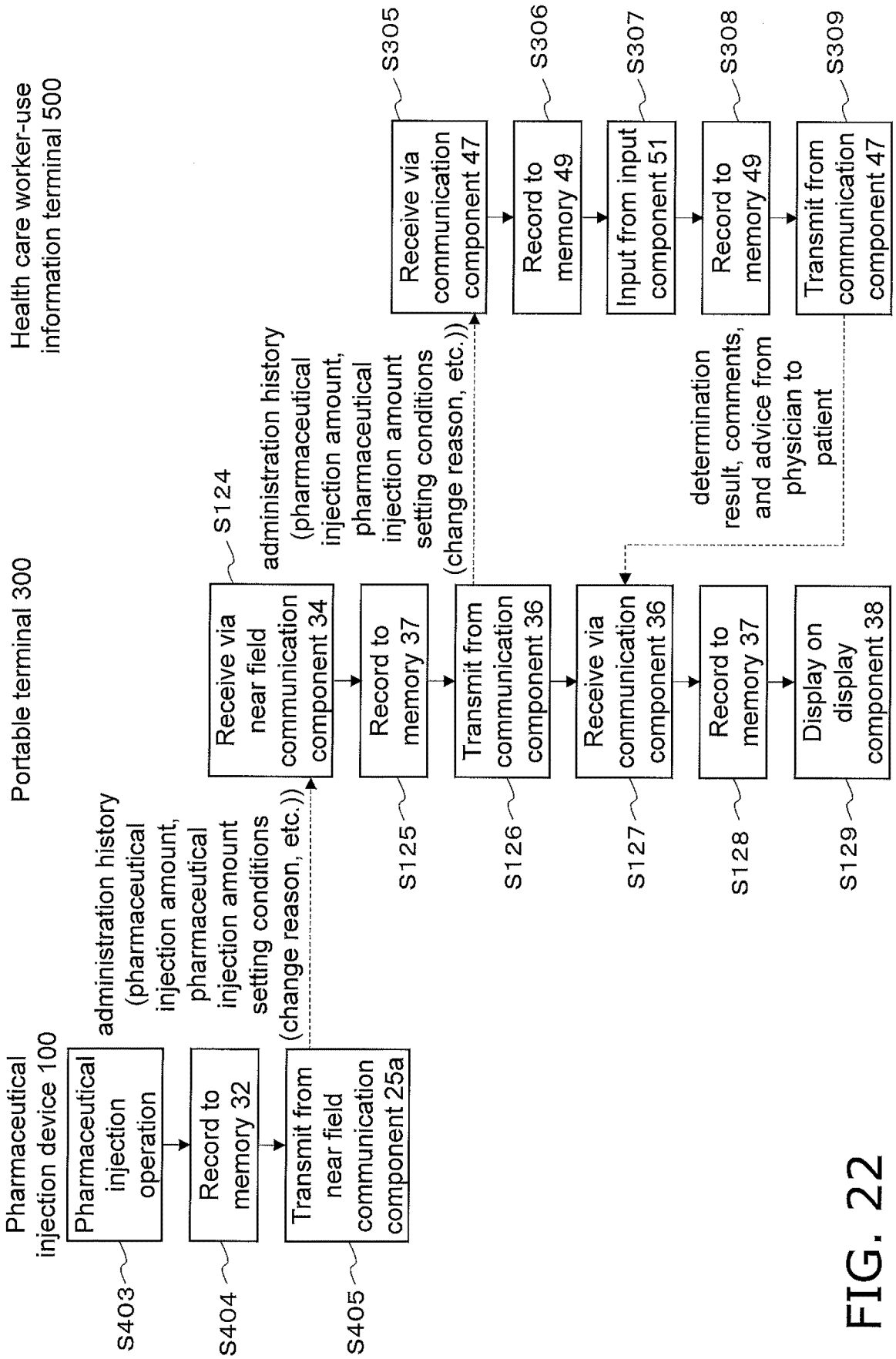

Pharmaceutical injection device 100
Portable terminal 300
Health care worker-use information terminal 500
Pharmaceutical injection operation
S403
Record to memory 32
S404
Transmit from near field communication component 25a
S405
administration history (pharmaceutical injection amount, pharmaceutical injection amount setting conditions (change reason, etc.))
Receive via near field communication component 34
S124
Record to memory 37
S125
Transmit from communication component 36
S126
Receive via communication component 36
S127
Record to memory 37
S128
Display on display component 38
S129
administration history (pharmaceutical injection amount, pharmaceutical injection amount setting conditions (change reason, etc.))
Receive via communication component 47
S305
Record to memory 49
S306
Input from input component 51
S307
Record to memory 49
S308
determination result, comments, and advice from physician to patient
Transmit from communication component 47
S309

FIG. 22

FIG. 23

Date	2/26	2/27	2/28	3/1	3/2	3/3	3/4
Adjustment amount in pharmaceutical administration	none	somewhat high	somewhat low	high	somewhat high	none	somewhat high
Blood glucose	normal	high	low	high	high	normal	high
Meal size	normal	large	small	large	normal	small	small
Activity	normal	high	normal	low	low	low	low
Administration date	on sched.	on sched.	on sched.	on sched.	on sched.	on sched.	on sched.
Valid adjustment amount (five-stage), weighted	none	somewhat high	low	high	high	none	somewhat high
Point total	0	2.5	–3.5	4.5	3	–0.5	1.5
Determination result (example)	good	good	fair	good	fair	good	good
Evaluation comments by physician, advice to patient (example)		Since blood glucose was low the next day, either the dose may not be adjusted, or activity may be reduced	A small adjustment amount is preferable, but a higher blood glucose level the next day may be a result of that	Let's reduce meal size and do some exercise	An increase is preferable for the adjustment amount. It was good that blood glucose level was returned normal level on the next day		

FIG. 24

Date	2/26	2/27	2/28	3/1	3/2	3/3	3/4
Adjustment amount in pharmaceutical administration	none	none	somewhat low	high	high	none	none
Blood glucose	normal	high	low	high	high	normal	high
Meal size	normal	large	small	large	normal	small	small
Activity	normal	high	normal	low	low	low	low
Other	on sched.	on sched.	on sched.	on sched.	on sched.	on sched.	on sched.
Valid adjustment amount (three-stage), weighted	none	high	low	high	high	none	none
Point total	0	2.5	–3.5	4.5	3	–0.5	1.5
Determination result (example)	good	fair	good	good	good	good	good
Evaluation comments by physician, advice to patient (example)		A large adjustment amount is preferable; let's reduce meal size		Let's reduce meal size and do some exercise	Let's do some exercise		

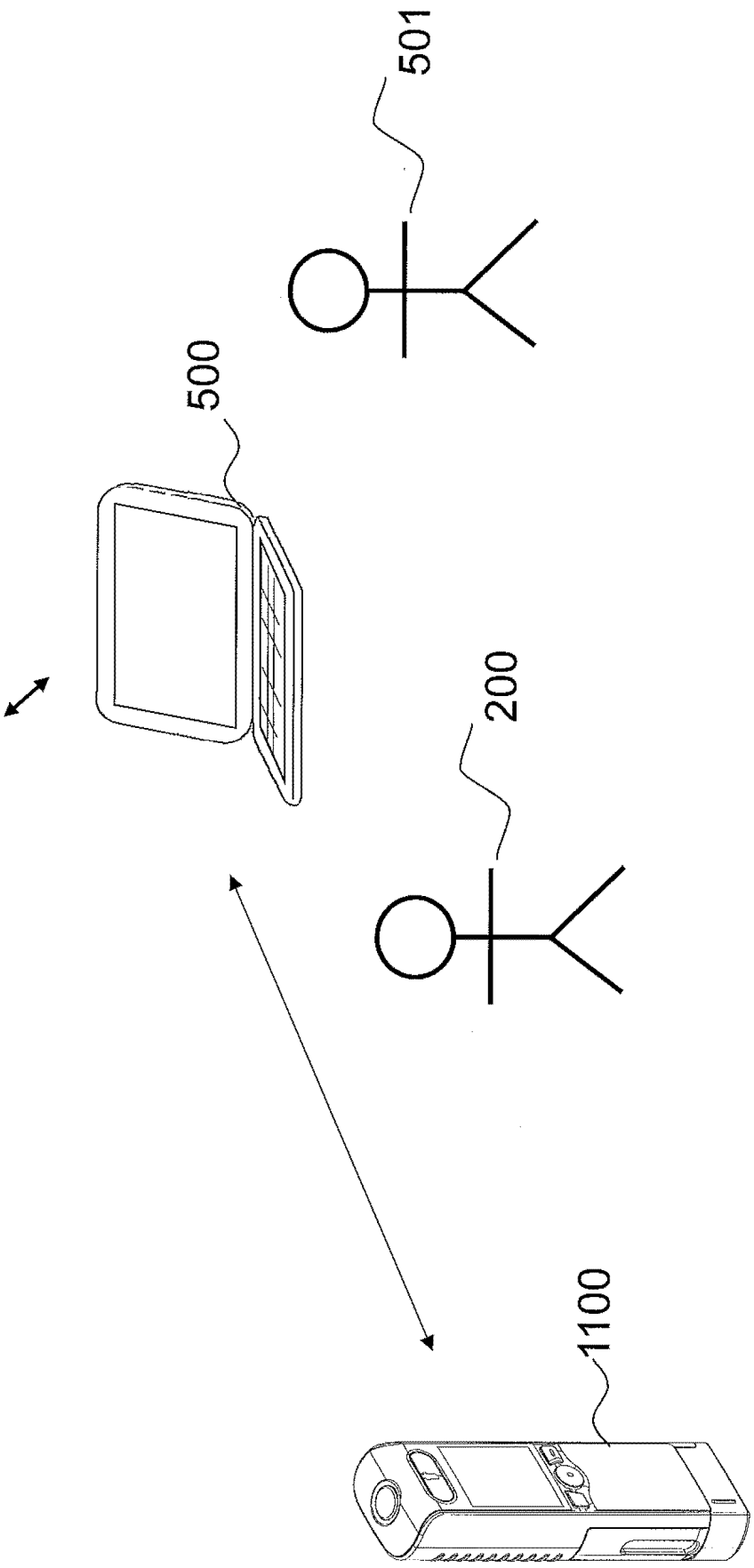


FIG. 25

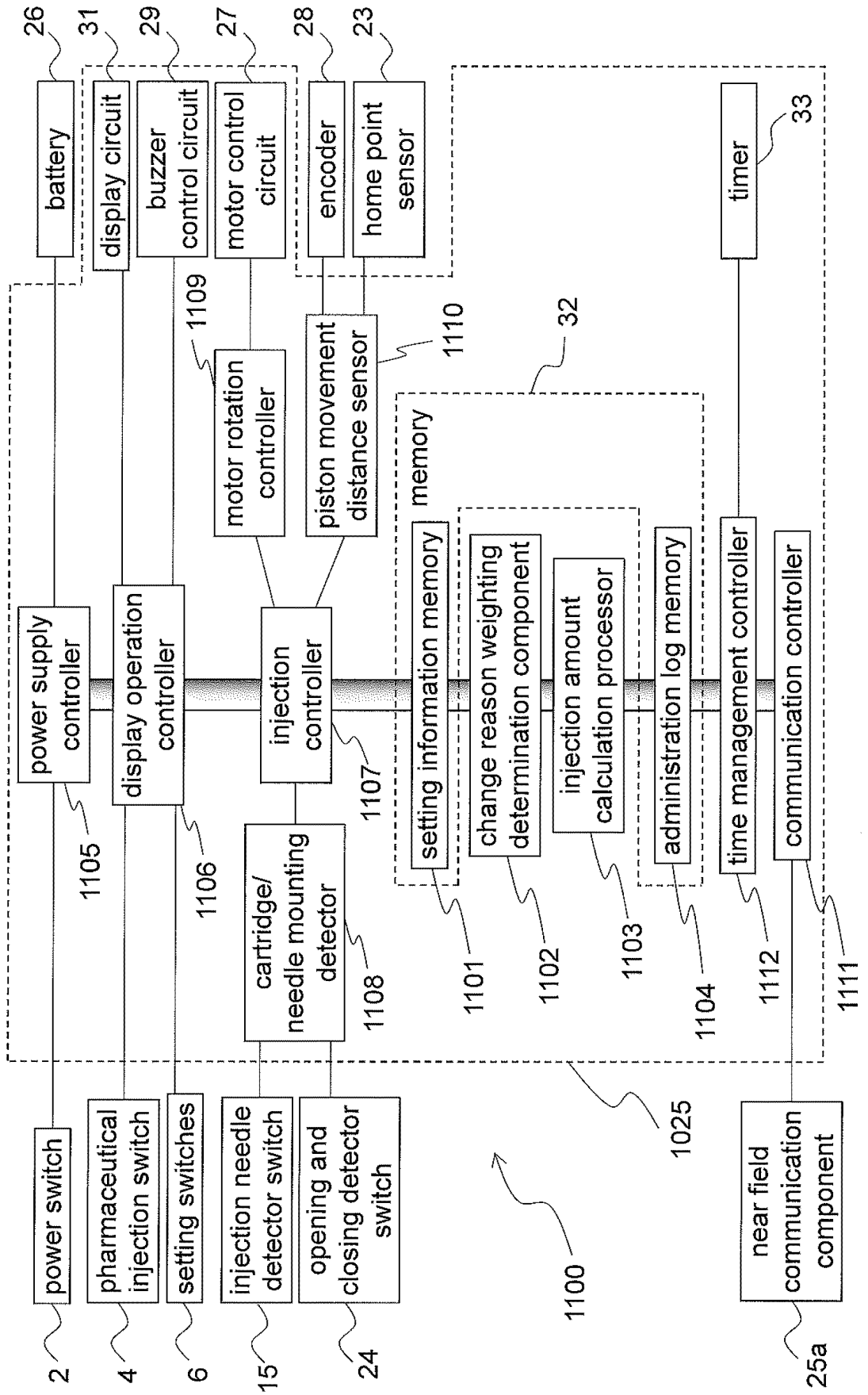
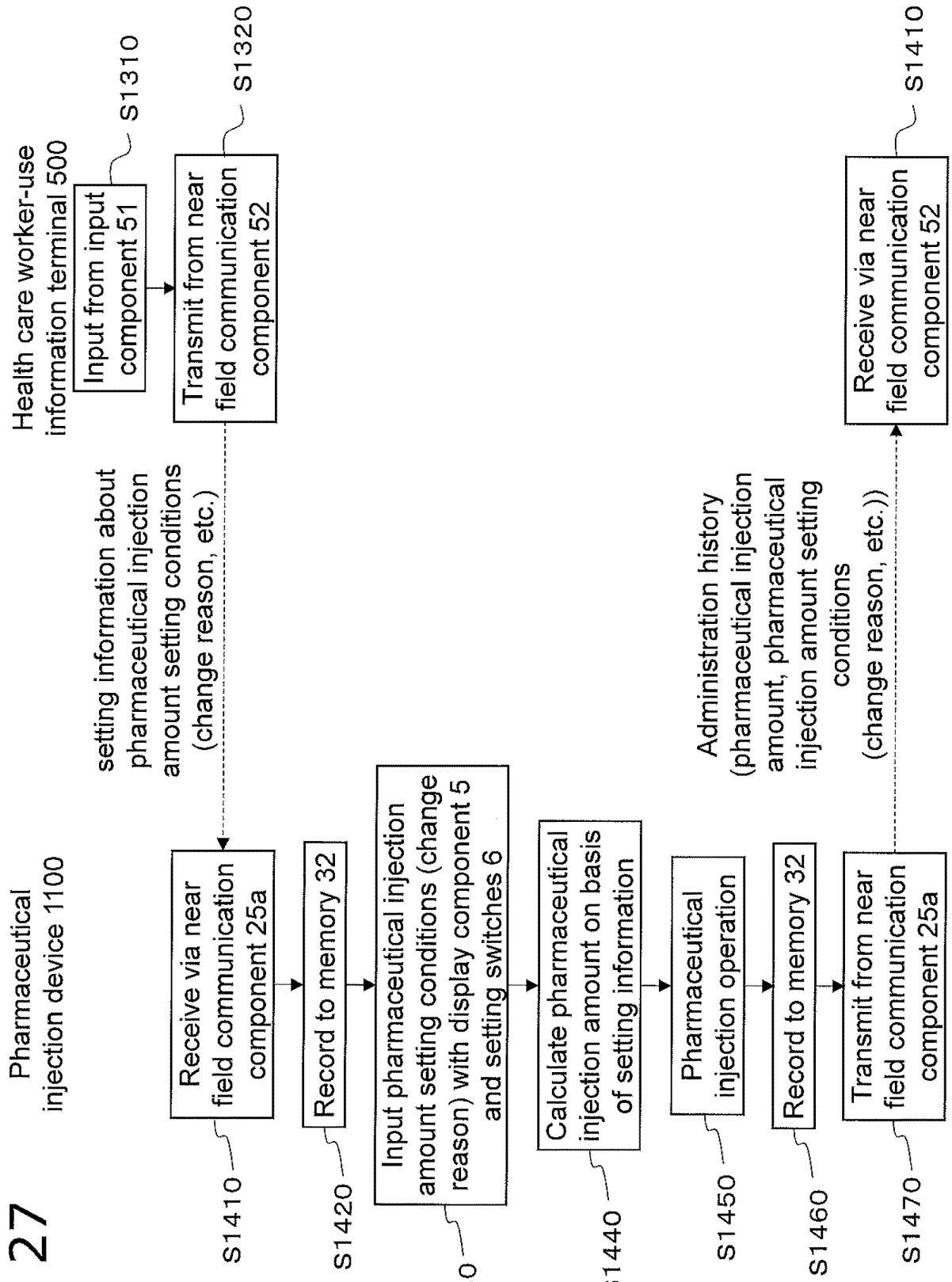

battery
display circuit
buzzer control circuit
motor control circuit
encoder
home point sensor
timer
motor rotation controller
piston movement distance sensor
power supply controller
display operation controller
injection controller
memory
setting information memory
change reason weighting determination component
injection amount calculation processor
administration log memory
time management controller
communication controller
cartridge/ needle mounting detector
power switch
pharmaceutical injection switch
setting switches
injection needle detector switch
opening and closing detector switch
near field communication component
26
31
29
27
28
23
33
1109
1110
32
1105
1106
1107
1108
1101
1102
1103
1104
1112
1111
1025
1100
2
4
6
15
24
25a

FIG. 26

FIG. 27


Pharmaceutical injection device 1100
Health care worker-use information terminal 500
Input from input component 51
S1310
Transmit from near field communication component 52
S1320
setting information about pharmaceutical injection amount setting conditions (change reason, etc.)
Receive via near field communication component 25a
S1410
Record to memory 32
S1420
Input pharmaceutical injection amount setting conditions (change reason) with display component 5 and setting switches 6
S1430
Calculate pharmaceutical injection amount on basis of setting information
S1440
Pharmaceutical injection operation
S1450
Record to memory 32
S1460
Transmit from near field communication component 25a
S1470
Administration history (pharmaceutical injection amount, pharmaceutical injection amount setting conditions (change reason, etc.))
Receive via near field communication component 52
S1410

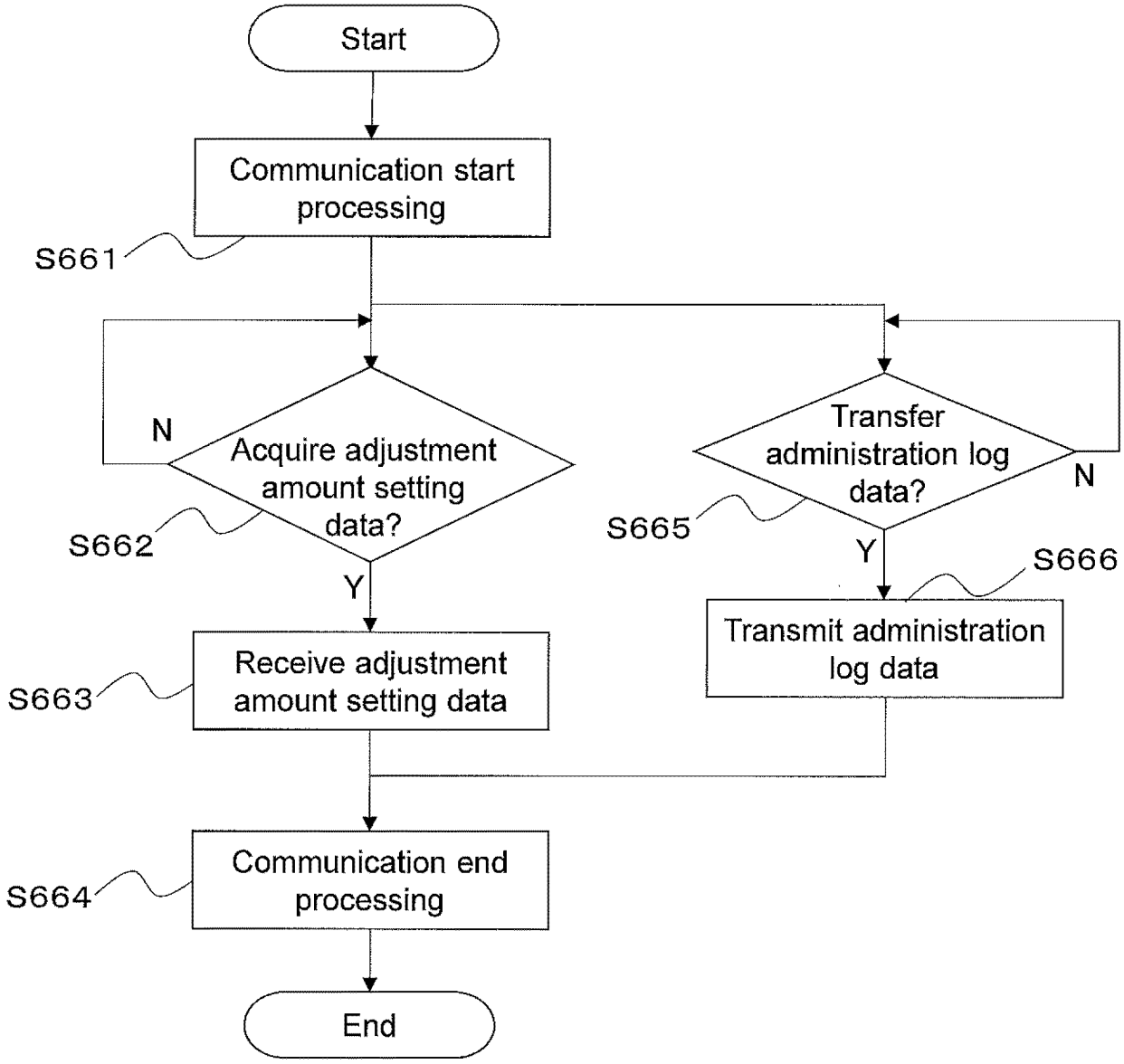

Start
Communication start processing
S661
N
Acquire adjustment amount setting data?
S662
Y
Receive adjustment amount setting data
S663
Transfer administration log data?
S665
N
Y
S666
Transmit administration log data
Communication end processing
S664
End

FIG. 28

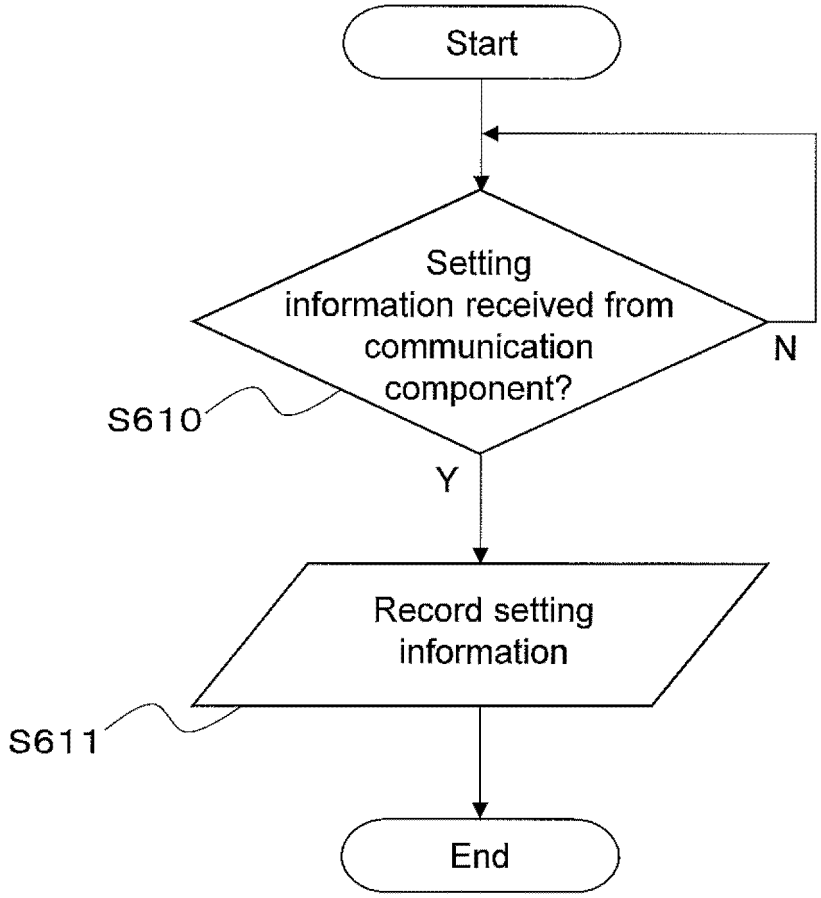

Start
Setting information received from communication component?
N
S610
Y
Record setting information
S611
End

FIG. 29

· Setting information about dose adjustment

Ex.: reference dose 40 units * set according to patient's condition and body weight

– Adjustment mode: simple mode

Ex.: With five-stage

adjustment amount level 1	+5 units
adjustment amount level 2	+2 units
adjustment amount level 3	±0 units
adjustment amount level 4	–4 units
adjustment amount level 5	–8 units

Ex.: With three-stage

adjustment amount level 1	+3 units
adjustment amount level 2	±0 units
adjustment amount level 3	–5 units
adjustment amount level 4	not used
adjustment amount level 5	not used

FIG. 30A

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· Change reason data for dose adjustment

Ex.: Change reason 1 blood glucose

level 1 text	"high"
level 1 help	"average blood glucose level over the past two to three days is above 200 mg/dL, and is above 160 mg/dL before breakfast"
level 2 text	"normal"
level 2 help	"average blood glucose level over the past two to three days is 80 to 200 mg/dL, and is 60 to 160 mg/dL before breakfast"
level 3 text	"low"
level 3 help	"average blood glucose level over the past two to three days is below 80 mg/dL, and is below 60 mg/dL before breakfast"

Ex.: Change reason 2 meal size * under restricted diet

level 1 text	"large"
level 1 help	"intake energy is above 1200 kcal/day and carbohydrate count is above 500 g/day"
level 2 text	"normal"
level 2 help	"intake energy is 600 to 1200 kcal/day and carbohydrate count is 200 to 500 g/day"
level 3 text	"low"
level 3 help	"intake energy is below 600 kcal/day and carbohydrate count is below 200 g/day"

Ex.: Change reason 3 Activity

level 1 text	"low"
level 1 help	"consumed energy is below 1000 kcal/day, number of steps is below 2000 per day, and metabolic equivalents is below 1 per day"
level 2 text	"normal"
level 2 help	"consumed energy is 1000 to 2000 kcal/day, number of steps is 2000 to 10,000 per day, and metabolic equivalents is 1 to 5 per day"
level 3 text	"high"
level 3 help	"consumed energy is above 2000 kcal/day, number of steps is above 10,000 per day, and metabolic equivalents is above 5 per day"

Ex.: Change reason 4 Other

level 1 text	"late"
level 1 help	"user has forgotten to take an injection, etc."
level 2 text	"on schedule"
level 2 help	""
level 3 text	"early"
level 3 help	"when the user wants to take an injection before going out(when it is done earlier than the scheduled time)." "user wants to take additional injection because dose was too low previous time, etc."

FIG. 30B

· Combinations of change reasons and adjustment amount weighting parameters

Ex.: Five-stage adjustment amount, weighted

	Change reason 1, blood glucose	Change reason 2, meal size	Change reason 3, activity	Change reason 4, other
Change reason level 1 (adjustment amount "increase" cause)	2	1.5	1	0.5
Change reason level 2 (adjustment "unnecessary" cause)	0	0	0	0
Change reason level 3 (adjustment amount "decrease" cause)	-2	-1.5	-1	-0.5

Adjustment point total calculation formula	Add points for change reason level on day of input

If point total is +3 to +5	Adjustment amount level 1	"high"
If point total is +1.5 to +2.5	Adjustment amount level 2	"somewhat high"
If point total is –1 to +1	Adjustment amount level 3	""
If point total is –2.5 to –1.5	Adjustment amount level 4	"somewhat low"
If point total is –5 to –3	Adjustment amount level 5	"low"

(since "normal" is not displayed)

Ex.: Three-stage adjustment amount, unweighted

	Change reason 1, blood glucose	Change reason 2, meal size	Change reason 3, activity	Change reason 4, other
Change reason level 1 (adjustment amount "increase" cause)	1	1	1	1
Change reason level 2 (adjustment "unnecessary" cause)	0	0	0	0
Change reason level 3 (adjustment amount "decrease) cause	-1	-1	-1	-1

Adjustment point total calculation formula	Add points for change reason level on day of input

If point total is +2 to +4	Adjustment amount level 1	"high"
If point total is –1 to +1	Adjustment amount level 2	""
If point total is –4 to –2	Adjustment amount level 3	"low"

(since "normal" is not displayed)

FIG. 30C

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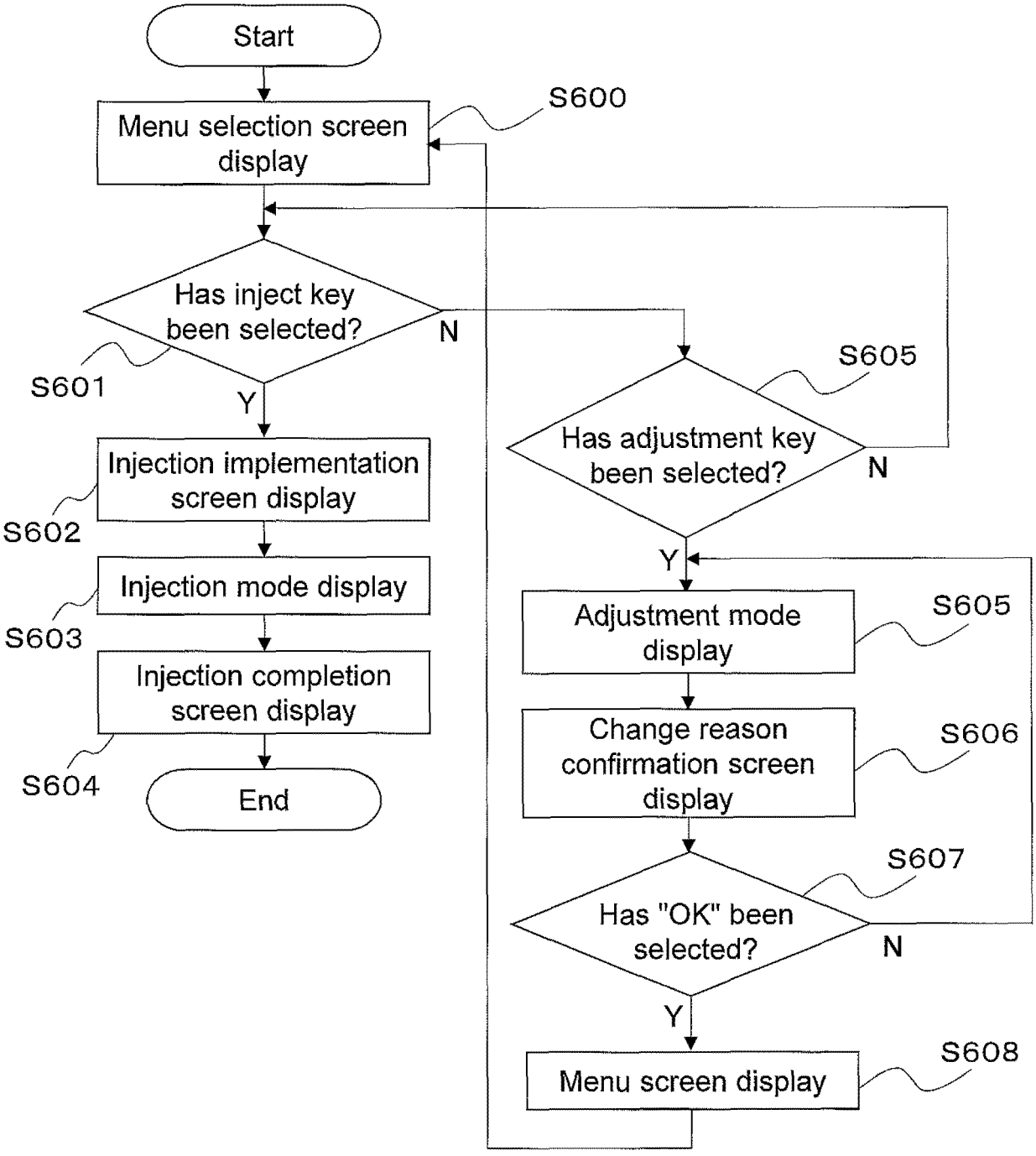
Start
Menu selection screen display
S600
Has inject key been selected?
N
S601
Y
Injection implementation screen display
S602
Injection mode display
S603
Injection completion screen display
S604
End
S605
Has adjustment key been selected?
N
Y
Adjustment mode display
S605
Change reason confirmation screen display
S606
S607
Has "OK" been selected?
N
Y
Menu screen display
S608

FIG. 31

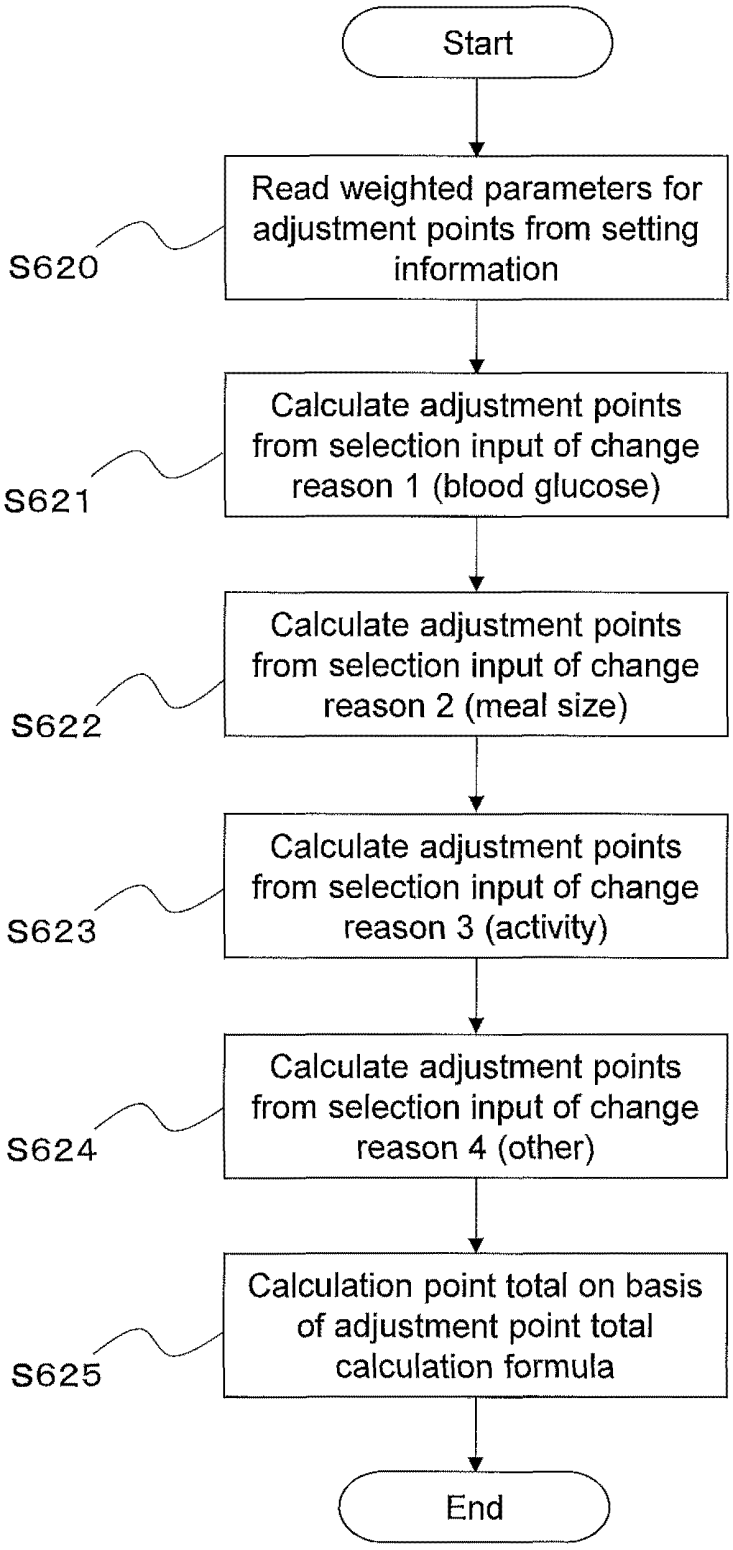
Start
Read weighted parameters for adjustment points from setting information
S620
Calculate adjustment points from selection input of change reason 1 (blood glucose)
S621
Calculate adjustment points from selection input of change reason 2 (meal size)
S622
Calculate adjustment points from selection input of change reason 3 (activity)
S623
Calculate adjustment points from selection input of change reason 4 (other)
S624
Calculation point total on basis of adjustment point total calculation formula
S625
End

FIG. 32

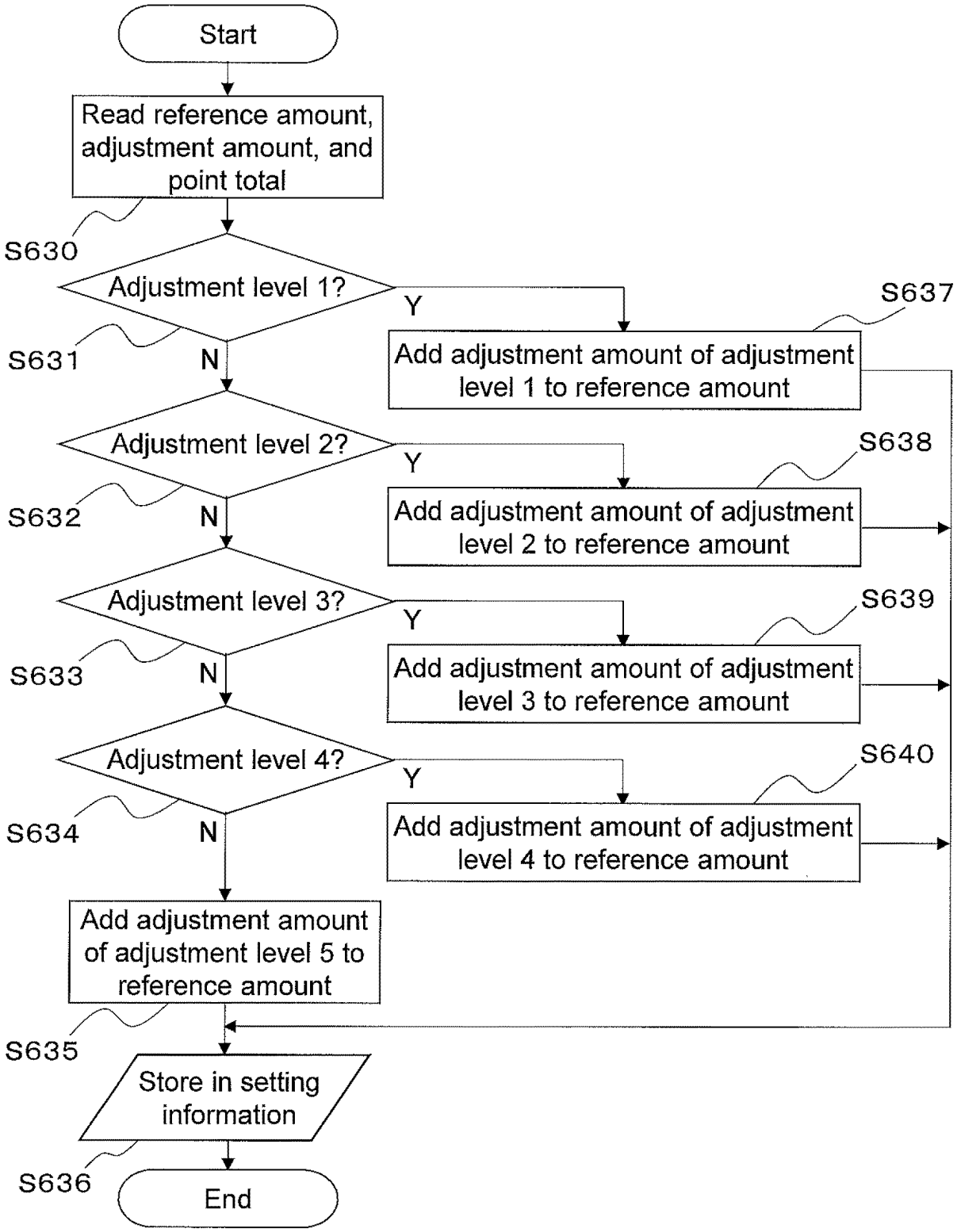
Start
Read reference amount, adjustment amount, and point total
S630
Adjustment level 1?
Y
S637
Add adjustment amount of adjustment level 1 to reference amount
S631
N
Adjustment level 2?
Y
S638
Add adjustment amount of adjustment level 2 to reference amount
S632
N
Adjustment level 3?
Y
S639
Add adjustment amount of adjustment level 3 to reference amount
S633
N
Adjustment level 4?
Y
S640
Add adjustment amount of adjustment level 4 to reference amount
S634
N
Add adjustment amount of adjustment level 5 to reference amount
S635
Store in setting information
S636
End

FIG. 33

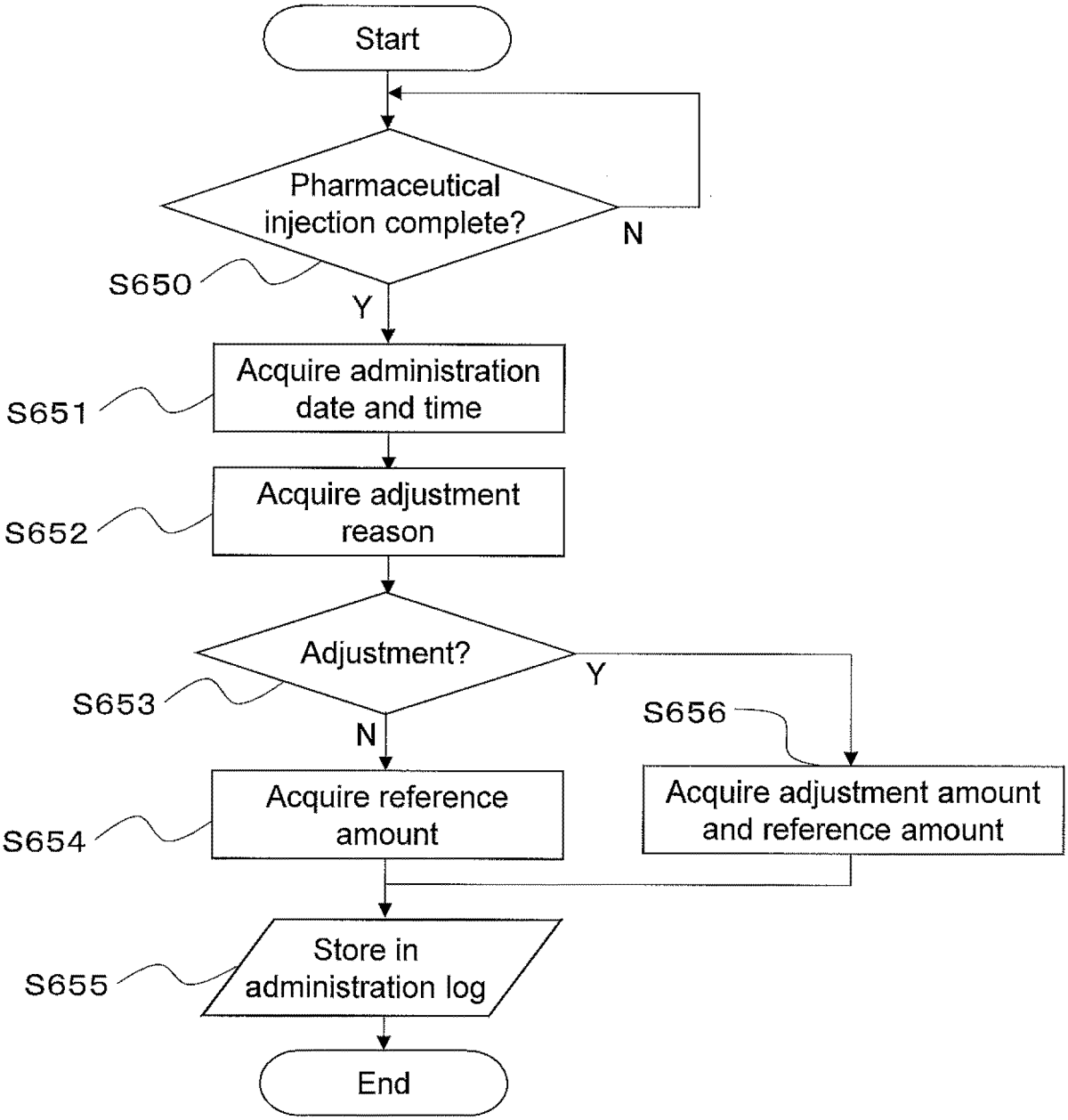
Start
Pharmaceutical injection complete?
N
S650
Y
Acquire administration date and time
S651
Acquire adjustment reason
S652
Adjustment?
Y
S653
S656
N
Acquire reference amount
S654
Acquire adjustment amount and reference amount
Store in administration log
S655
End

FIG. 34

■ Data (administration log data) transmitted from pharmaceutical injection device (injector) to health care worker-use information terminal (PC)

· Pharmaceutical administration information (administration log data)

Ex.:	Administration date:	3/5/14	
	Administration time:	1:00 pm	
	Reference dose:	40 units	
	Adjusted dose:	45 units	
	Change reason 1:	large meal size	(or small meal size)
	Change reason 2:	high blood glucose level	(or low blood glucose level)
	Change reason 3:	none	(high or low activity level)
	Change reason 4:	none	(later or earlier than scheduled)

FIG. 35

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/077433

A. CLASSIFICATION OF SUBJECT MATTER
A61M5/168(2006.01)i, *G06Q50/24*(2012.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61M5/168, G06Q50/24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2015
Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2010-505593 A (Medsolve Technologies, Inc.), 25 February 2010 (25.02.2010), paragraphs [0021] to [0034], [0038] to [0049], [0052] to [0054]; fig. 1 to 7 & US 2008/0086086 A1 paragraphs [0027] to [0040], [0044] to [0055], [0058] to [0060]; fig. 1 to 7 & WO 2008/045896 A2	5,6,10-12 1-4,7-9
Y	JP 2014-507223 A (Sanofi Aventis Deutschland GmbH), 27 March 2014 (27.03.2014), paragraphs [0085], [0231] to [0236]; fig. 9, 23 & US 2014/0005603 A1 paragraphs [0167], [0359] to [0364]; fig. 9, 23 & WO 2012/110474 A1 & CA 2826617 A1	1-4,7-9

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
04 December 2015 (04.12.15)	15 December 2015 (15.12.15)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/077433

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2008-229331 A (Lifescan, Inc.), 02 October 2008 (02.10.2008), paragraphs [0153] to [0156]; fig. 18 & US 2008/0235053 A1 paragraphs [0152] to [0155]; fig. 18 & EP 2184694 A2 & CA 2627386 A1 & CN 101288593 A	2

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/077433

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

It is considered that the special technical feature of the invention described in claim 1 resides in a matter that "the medicine injection apparatus is equipped with: a cartridge holder to which a medicine cartridge can be attached; a main body case at which the cartridge holder is provided in an openable and closable manner; a piston which can be inserted into the medicine cartridge attached to the cartridge holder in the main body case; a piston driving mechanism which enables the movement of the piston in such a manner that the piston can be inserted into the medicine cartridge; and a control unit which can drive the piston driving mechanism".
(Continued to extra sheet)

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/077433

Continuation of Box No.III of continuation of first sheet(2)

On the other hand, a technical feature which is same as or corresponding to the above-said special technical feature cannot be found in the invention of claim 5 which is an independent claim, the invention of claim 6, the invention of claim 10 and the invention of claim 11.

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2012034729 A **[0004]**